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OR
CLINICAL THERAPEUTICS

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A MANUAL

OF

MEDICAL TREATMENT

OR

CLINICAL THERAPEUTICS

BY

I. BURNEY YEO M.D. F.R.C.P.

PROFESSOR OF CLINICAL THERAPEUTICS IN KING'S COLLEGE LONDON AND
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AUTHOR OF "FOOD IN HEALTH AND DISEASE" ETC.

WITH ILLUSTRATIONS

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MANUAL
OF
MEDICAL TREATMENT.

Part IV.

THE TREATMENT OF PHTHISIS, OR CONSUMPTION (PULMONARY TUBERCULOSIS).

CHAPTER I.

INDICATIONS AND PROPHYLAXIS.

Definition—*Indications* for *Treatment—Prophylactic* Measures—Avoidance of unsuitable Marriages—Measures to be enforced on those with *Hereditary* Predisposition—Management of Infancy and Childhood—Of Puberty and the Period of rapid Development—Value of Sea-air and Sea-baths for the Scrofulous—Tendency to Emaciation to be checked—*Catarrhal* Attacks to be guarded against—Utility of Pulmonary Gymnastics—Avoidance of unhealthy Occupations—Measures for preventing Dissemination of the Infective Germs—Risks of *Auto-infection*—Disinfection of Sputum, etc.

PULMONARY CONSUMPTION must now be regarded as an infective disease, originating in the introduction into the lungs of a specific infective organism from without, the development and spread of which depend on its encountering a suitable soil, or an inherited predisposition for its culture and growth.

We must regard the impairment of nutrition which we encounter in this disease, and which it will tax all our resources to arrest or check, not as the cause, as was formerly taught, but as the consequence of the pulmonary affection, as a consequence mainly of the infective fever which attends the development or the activities of the infective organism in the lungs, as well as in other organs.

The essential **indications** for **treatment** in pulmonary consumption are the following:—

1. To prevent or amend those faults of constitution, organisation, and development which predispose to the acquirement of the disease.

2. To prevent or cure those local pulmonary affections which may induce a tendency to this disease, even where no constitutional predisposition exists.

3. To prevent the possible spread of the disease by the conveyance of its germs from the sick to those who are necessarily or accidentally brought into close contact with them.

4. To endeavour, if possible, to antagonise the morbid activities and influences of the infective organism on the lung tissues and on the constitution. To attempt to hinder its extension to the sound parts of the affected lung, and also to the sound unaffected lung, and to prevent the infection of other organs.

5. To lessen and remove the *fever* and other constitutional disturbances dependent on the infection of the system, as well as on the local irritation.

6. To lessen and arrest the local irritation and catarrhal and inflammatory changes excited by the tubercular infection.

7. To improve the disturbed and defective nutrition by all the resources at our command—medicinal, regiminal, and climatic.

8. To relieve the various distressing symptoms and remedy the several serious complications which occur in the course of the malady.

And, first, with regard to **prophylactic treatment.** The prevention of pulmonary consumption may be regarded from three principal points of view: (*a*) the prevention of the transmission of the phthisical disposition or tendency from parent to offspring; (*b*) the prevention of the development of the disease when the predisposition exists; and (*c*) the prevention of those unhealthy conditions, habits, and circumstances of life which are known to favour the acquirement and propagation of phthisis.

(*a*) The hereditariness of phthisis has been placed beyond doubt, but from the point of view of prophylaxis it is important to remember that by the hereditary nature of phthisis we do not mean that phthisical parents convey to their offspring a constitution which must *necessarily*, at a given period of life, develope tuberculous disease, but rather that they transmit to their children an organisation which renders them more prone than others to be attacked by phthisis.

It is undoubtedly the duty of the physician to give timely warning of the danger and distress which is almost certain to follow in the train of marriages between persons who are known to inherit a tendency to tuberculous disease.

We should let it be generally known also that considerable risk attends the union of persons closely allied by ties of consanguinity.

Marriage too early or too late in life, marriage between the constitutionally feeble, between persons weakened by dissipation or excesses of any kind, or by poverty and privation, and between the subjects of constitutional syphilis, should all be prevented, so far as we can, by judicious and timely counsel and warning, prevent them.

(*b*) Next, as to the best means of preventing the development of phthisis in those persons in whom a tendency to that malady is known to exist.

An infant born with such a tendency will require the most careful management. On no account should a mother with phthisical tendencies be allowed to suckle her offspring. There is danger in this both to mother and child. For such infants a vigorous and healthy wet-nurse should be selected, and if possible they should be brought up in the free open air of the country, rather than in the confined atmosphere of crowded cities.

Their chest and limbs should not be cramped by any tightly-fitting garments, but allowed perfect freedom of movement. The nurse should be particularly cautioned against permitting awkward attitudes, which tend to compress the chest and to hinder its free expansion.

Attempts should early be made to ward off that morbid sensitiveness and vulnerability of the cutaneous surface so common in those predisposed to phthisis, which is, in a measure, the index of bronchial sensitiveness and irritability. We should even in the early months of infant life adopt mildly bracing measures, which may afterwards give place to a more vigorous hardening system. For this purpose, it is a good plan, after the child's morning bath, to sponge over the surface of the body rapidly with cold sea-water, or water containing sea-salt, to which a tablespoonful or two of spirits of wine or eau-de-Cologne have been added. This process has a bracing and invigorating effect, especially stimulating to the functions of respiration.

When it is impracticable to obtain a wet-nurse, the child should be given perfectly fresh cow's milk, boiled, slightly diluted with water, and with a little sugar of milk added. At the period of teething a little beef-tea may be added to the milk, and if dentition be tardy or difficult, some preparation of lime is useful.*

More than ordinary care is needed in watching these children through the common ailments of childhood, especially measles, whooping cough, and scarlet fever. Measles and whooping cough are especially dangerous to such children, for the catarrhal and congestive attacks of the respiratory organs, which so constantly accompany these affections, are prone to linger and predispose to incurable pulmonary mischief.

When the child reaches five or six years of age, judicious and careful attempts to further brace and harden the constitution should be systematically pursued. For this purpose free exercise in the open air, wisely devised gymnastic exercises, and cold sponging, cold affusion, or very brief cold douches, should be daily employed.

---

* Full details as to the preparation of suitable food for infants and young children will be found in the author's work on "Food in Health and Disease," chap. xi.

It is necessary to watch carefully the education and school-life of such children. Close application to study in crowded school-rooms must be positively forbidden; overtaxing the physical and mental powers must be carefully avoided, and all faulty attitudes and positions during school studies should be corrected.

There are two periods of life which have been regarded as specially dangerous for those who inherit a predisposition to phthisis. One is the period of puberty, and the other is the period between the ages of 30 and 35.

At the period of puberty we have to guard against the depressed nutrition so often associated with the exhaustive influence of rapid growth. A life of wholesome activity in the open air, out-of-door exercises and occupations, a nutritious but unstimulating diet, as well as the provision of healthy food for the mind and the avoidance of romantic and erotic literature: these are wise and necessary precautionary measures at this period of life.

When the strength and nutritive power seem seriously impaired by rapid growth, it will be advantageous for such cases to seek a sunny climate in winter, and tonic mountain or sea air in summer: in both cases in situations where an out-of-door life is possible.

The extreme value of sea air and sea baths in combating the tendency to scrofulous affections has been established by long experience, and for delicate children and young people presenting the signs of the scrofulous diathesis, prolonged residence at the seaside and the regular use of sea baths, cold in the summer, and, if necessary, warmed in the winter, are of the greatest benefit.

The occurrence of loss of flesh is often one of the first evidences of impending danger. But it would be incorrect to conclude, on that account, that all the subjects of progressive emaciation are on their way to become tuberculous.

The emaciation which is observed to be so frequently the precursor of pulmonary phthisis is probably, in most instances, but the first symptom of the actual presence of the disease; a vigilant prophylaxis then requires us to be on our guard, lest we allow a tendency to progressive emaciation in the young and delicate to proceed unnoticed. In such cases we should exercise a careful supervision over the diet, and see that it is sufficient in all respects, and that it includes an adequate proportion of fat and flesh-forming food in an easily digestible form.

Much gentle—not exhausting—exercise in the open air is beneficial to such persons, such as horse, or carriage, or boat exercise.

(*c*) All such persons as we have been referring to should be protected in every way from the causes of catarrhal, congestive, or inflammatory attacks of all kinds; from indiscreet exposure to changeable or inclement weather; from the dangers of over-excitement, and from draughts and rapid changes of temperature.

Suitable gymnastic exercises for the purpose of increasing the capacity of the thorax, generally small and narrow in such persons, of strengthening the respiratory muscles and those of the upper limbs, and so of promoting lung ventilation, are of undoubted value.

A few weeks during summer, or a longer period if any troublesome catarrhal attacks have occurred, spent in some mountain valley, from 4,000 to 6,000 feet above the sea level, is valuable, not only for its general bracing effect, but for the pulmonary gymnastics which a residence in the rarefied air of these regions necessitates, and the more complete pulmonary ventilation thereby secured.

All occupations should be avoided which entail confinement in close, ill-ventilated apartments or workshops, as well as those which necessitate cramped attitudes and positions which interfere with proper expansion of the chest; so also should all employments which involve exposure to irritating vapours or dusts, or other injurious influences, such as sudden and great changes of temperature, which may excite or maintain catarrhal conditions of the air-passages. The choice of out-of-door occupations and the avoidance of sedentary ones should be urged on all those who inherit a tendency to phthisis.

The important point of the prevention of the transmission or **communication** of the tubercle germ from the sick to the sound must next be considered.

It is impossible, in the face of the evidence, clinical and experimental, which has been accumulated of late years, to doubt the fact that phthisis is spread by communication, chiefly through the agency of the sputum, which, when dried, is converted into dust, and carried into the atmosphere.

A mass of testimony has been advanced in proof of the possibility of the communication of tuberculous infection from the phthisical to those who may be brought into intimate association with them, and who may neglect to take those precautions to avoid infection, which modern research has shown to be necessary.

Disinfection or destruction of the **sputum** of phthisical patients is of chief importance in preventing the communication of the disease from the sick to the sound. In most cases of phthisis the sputum contains *tubercle bacilli*, often in great numbers, and generally in the spore-bearing condition, each bacillus containing one to three or four spores. These spores are very tenacious of life, and will bear far greater extremes of heat and cold than the bacilli. But they may be killed by exposure for fifteen minutes to a moist heat of 212° F., or by plunging them into boiling water. Probably the best means of disinfecting sputum containing these spore-bearing bacilli is to mix it with a five per cent. solution of carbolic acid. But even this requires a contact of twenty-four hours. Exposure to boiling water for ten minutes, or to steam at a temperature of 212° F. for half-an-hour to an hour, is also effective.

The danger of *auto-infection* cannot thus be obviated. "A patient on the road to recovery may be re-infected by his own sputum." If during expectoration some of the sputum should be accidentally aspirated into the sound lung or the sound parts of the affected lung, fresh centres of infection may be started. Some may also be swallowed and infect the intestinal canal. The only remedy for such dangers is the regular use of antiseptics, internally and and by inhalation—antiseptic vapours and sprays—the latter expressly for the purpose of ensuring the expectoration of the contents of cavities in contact with an antiseptic medium. Those who have foolishly spoken slightingly of antiseptic inhalations have evidently not realised the nature of the services they can perform.

Linen, handkerchiefs, sheets, etc., which have incurred the risk of contamination with phthisical sputum may be disinfected by boiling water; blankets, mattresses, etc., by exposure to steam for an hour, or to a dry heat (as in a disinfecting stove) of 250° F. for several hours.

The risk of infection by the dust of dried sputum may be provided against, to some extent, by the following precautions. Phthisical patients must be warned not to spit on the floor, rugs, or carpets, nor in the streets nor into handkerchiefs, unless Japanese paper ones, which can be burnt afterwards; but as some sensitive patients will scarcely be prevented from using handkerchiefs for this purpose, these should be plunged into boiling water as soon as they have been used. Convenient spittoons should be provided for every patient, containing a little five per cent. carbolic solution to disinfect and keep the sputum moist. These can be made of pasteboard, enclosed in a tin case, so that they can be burnt after use, and the tin case scalded with boiling water. Fig. 1 shows the pattern of one commonly used in America, and termed "Sanitary Cuspidor."

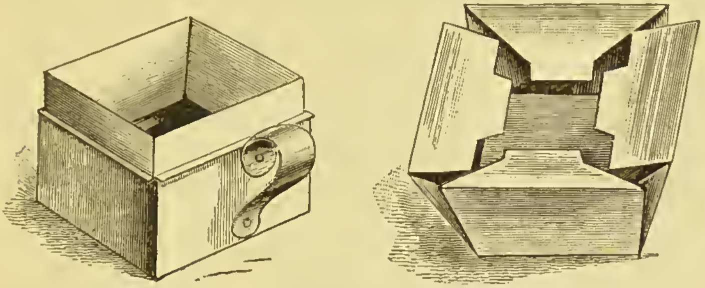

Fig. 1.—Sanitary Cuspidor.

Dettweiler has devised a convenient flask for carrying in the patient's pocket, so as to avoid the necessity of spitting into a handkerchief or in the street; it is shown in Fig. 2.

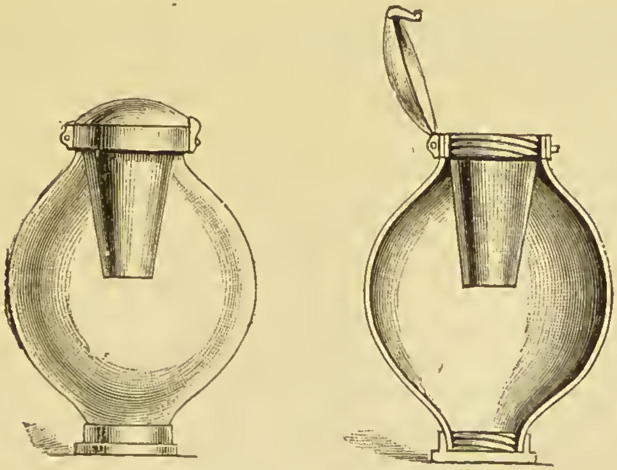

Fig. 2.—Dettweiler's Pocket Flask.

It is flat, made of blue glass, and holds about three ounces. It will be seen that it has an opening at the top and bottom, fitted with screw caps. To the upper opening is fitted a tightly-shutting spring cover or lid, and a polished metal funnel, which reaches half-way down into the flask. This funnel acts like that of certain ink-bottles, and prevents the spilling of the contents of the flask even if the cap is left open. The lower opening allows it to be thoroughly cleansed. It is partly filled with disinfecting fluid, its contents are frequently burnt, and the vessel is cleansed with boiling water.

Spittoons should be kept *covered*, lest *flies* settling upon sputum should be the means of carrying infection. In clubs and public places spittoons should be filled with sawdust saturated with a solution of carbolic acid, and their contents frequently burnt.

As the hair, especially that of the beard, and the nails of phthisical patients may become soiled by sputum, the hair and beard should be worn short, and the nails and beard frequently washed with disinfecting soap. Dust should be prevented from collecting or depositing itself in the rooms occupied by phthisical patients. The walls should be rubbed down with new bread, which is then burnt, and the furniture frequently wiped with a cloth damped by some antiseptic solution. The floor should be sprinkled before sweeping, and the sweepings burnt. Carpets and curtains are best dispensed with altogether. The rooms should be kept thoroughly ventilated.

Very close intimacy with the subjects of advanced phthisis should be avoided, and the bedroom of a phthisical patient should not be shared by anyone. Kissing on the lips should be forbidden, and also sexual intercourse. The rooms that have been occupied by phthisical patients must be thoroughly cleansed before they are lived in by others.

Thorough cleanliness, personal and general, is, in short, the best protection.

CHAPTER II.

THE GENERAL MEDICINAL TREATMENT OF PHTHISIS.

Classification of Cases of Phthisis according to their Amenability to Treatment—Conditions of Curability—The Use of Antiseptic Agents—By Inhalation in Inhalation Respirators—Iodine—Ethyl Iodide—Iodoform—Sodium Benzoate—Creasote and Guaiacol—Various Modes of their Administration—Inhalation of Creasote Vapour in compressed Air—Rectal Injections of Sulphuretted Hydrogen—Inhalations of Hydrofluoric Acid—Of superheated Air—Injections of Cantharidinate of Potash—Turpentine—Camphor—Chloroform—Eucalyptol—Monochlorophenol—Menthol—Aristol—Myrtol—Balsam of Peru—Chlorine—Ozonised Oxygen—Mercuric Biniodide—Calomel—Iodine with Chloride of Gold and Sodium—Tannin—Intrapulmonary and Intratracheal Injections—Tuberculin—Goat's Blood and Dog's Serum—The Alkaline Hypophosphites—Arsenic—Iron—Cod-liver Oil—Glycerine—Mineral Waters and the Inhalation of Nitrogen. Additional Formulæ.

FROM the point of view of **treatment**, cases of pulmonary phthisis may be roughly classified into—

1. The curable.
2. The remediable.
3. The irremediable.

If we were to discover, at this present time, a perfectly certain remedy for phthisis, it ought scarcely to be necessary to say that it would only cure the "curable" cases, and it would only remedy the "remediable" ones.

If there exists a means of curing this disease, there will be laws which determine and control the cure, just as there are laws which determine and control the course of the disease. It is only in this sense that there exists a cure for any disease.

It is in the nature of pulmonary tuberculosis to cause progressive destruction of the organ it attacks. If any portion of the adult lung is destroyed, it can never be restored to its former state of integrity. If a large portion is destroyed, it must ever remain so.

It is clear, then, that the restoration of a lung to its former state of integrity in a case of phthisis must be of the rarest occurrence, and if any remedy can ever have led (or shall ever lead) to such a result, it *must* have been applied in a *very early* stage of the disease.

If, then, we are to *cure* phthisis, we must, whatever our remedy may be, treat it in its earliest stage, before it has led to any considerable destruction of lung tissue; but we may *arrest the course* of the disease, and so *remedy* cases, even when the disease is somewhat advanced.

But there is yet another condition, other than the amount or stage of the local disease, which will determine the results of treatment and the classification of the case in regard to it: and that is the power of resistance in the organism to the infecting agent.

A physician who has had a large experience of cases of phthisis, often, in his own mind, feels inclined to regard a case as probably irremediable, although he may be consulted at the very earliest appearance of local physical signs. He sees profound constitutional disturbance, and he fears the disease will run a rapid course, do whatever he may. These are cases of acute and subacute phthisis. In these cases, possibly, a considerable diffusion of the infective organism has taken place before the development of any recognisable physical signs.

It should be remembered that a remedy which may be most efficacious in the earliest stage of phthisis is not, in the least degree, less a remedy for phthisis because it fails to produce any great result in more advanced cases; also that a remedy which may be efficacious in arresting the progress of the disease in one person—in one organism—will not be, in the least degree, less a remedy for phthisis because it fails to arrest the disease in another organism.

Whatever observations we may make with respect to the treatment of phthisis must be regarded as always qualified by the preceding considerations; and we would counsel those who may have to consider the subject of remedial agents in phthisis to keep these truths in their minds.

Briefly, then, the **conditions** of **possible cure** in cases of phthisis are these:—(1) *Early recognition* of the disease, when the tubercular lesions are small and isolated—what we have spoken of elsewhere as the "pre-phthisical period." (2) The *early occurrence* of hæmoptysis we regard as a favourable condition, chiefly because it calls attention in a striking manner to the existence of this early stage; for it commonly happens that we can detect few, if any, characteristic physical signs in the lungs at the time of these early attacks of hæmorrhage. (3) A natural tendency in the evolution of the tubercular infiltration to *sclerotic* or *fibroid* changes is a very favourable condition; this tendency may be found pre-existing in the constitution, and may lead to spontaneous cure, or it may be promoted by suitable treatment. (4) The absence of great tissue sensitiveness or irritability; the absence of that tendency to acute inflammatory reaction to the bacillary infection, the presence of which is so unfavourable a prognostic. (5) The absence of hereditary predisposition, and the possession of a sound, vigorous constitution, which has become accidentally infected by the tubercle bacillus. (6) A mitigated virulence of the bacillary infecting agent, and the small quantity or number that originally gain access to the lungs, and their access through the air-passages rather than through the vascular channels. We have dwelt more fully on these conditions elsewhere.*

The use of antiseptic agents.—We have already formulated the following as one of the indications for the treatment of pulmonary consumption:—

"To endeavour, *so far as possible*, to antagonise the influence of the infective organism on the lung tissues and on the constitution. To attempt to hinder its extension to the sound parts of the affected lung, and also to the sound unaffected lung, and to prevent the infection of other organs."

---

* "The Conditions of Cure in Consumption," *Brit. Med. Journal*, Jan. 16, 1892.

It is impossible, in the rational treatment of phthisis, to lose sight of the fact that there is an infective organism not only developed and developing in the lung, *but actually diffused through the mucous* and *muco-purulent secretions in the air-passages.*

We know that the tubercle bacillus, in the vast majority of cases, reaches the lung from without, that it is taken in with the inspired air, and finding in the lung the conditions suitable to its existence and multiplication, it lives and multiplies there. Now, if we could alter or disturb those conditions we might hope, if not to arrest its vitality, at any rate to modify and diminish its morbid activity.

There are two channels by which we can attack and influence the infective organism in pulmonary phthisis: one is the very same channel by which it most commonly gains access to the organism, the air-passages of the lungs; the other is the blood.

There are also two conceivable methods by which we may influence the life and activities of this bacillus:—

1. By producing conditions more or less directly hostile to its existence: *i.e.* directly anti-bacillary.

2. By increasing the resisting power of the pulmonary tissues to its attacks.

But it will naturally be asked what has been the practical gain from the use of antiseptic remedies. We have seen it stated, and with authority,* that the use of antiseptics in the treatment of phthisis has been attended with no good results. Our own personal experience, as well as the recorded experience of the most competent and experienced observers, in our own and in all other countries of the world, proves the inaccuracy of this statement. It is possible to get good results, or no results, from the use of antiseptic agents, according to the amount of judgment exercised in the selection of cases, according to the amount of sincerity, earnestness, and discrimination

* *See* Latham's "Harveian Oration," 1888.

with which we employ the agents at our command, and according to the amount of co-operation and good faith we encounter in our patients.

We shall often find it impossible, with phthisical patients, to induce them loyally to follow any plan of treatment which requires constant trouble and attention; and it is extremely difficult to induce patients to breathe an antiseptic medicated atmosphere of sufficient concentration and with sufficient continuance to be of any real efficacy.

But when patients and their attendants have patiently, perseveringly, and adequately carried out the use of antiseptics, by inhalation and other methods of administration, we have seen remarkably good results, some of which we have published.*

Since using antiseptic inhalations in the treatment of phthisis, we find, even in fairly advanced cases, that when used continuously the progress of the disease is rendered much slower and quieter; and, compared with our former experience, we find the extension of the disease to the unaffected lung is remarkably delayed. Indeed, it is in preventing the extension of the disease to the hitherto sound lung, and in preventing laryngeal infection, that we consider this method so valuable and so important.

We are glad to observe that the sort of passive resistance to the use of antiseptic inhalations which was common in England a few years ago is now rapidly disappearing.

Wilson Fox, who was by no means an enthusiast in these matters, says: "There can be no question that inhalation practised in this manner,† with creasote, thymol, eucalyptus, iodoform, iodine, or terebene, tends to diminish cough and expectoration, and that in some cases marked improvement in the patient's state occurs during their use, even in very advanced stages." ‡

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* *Brit. Med. Journal*, January 12, 1884: "Lectures on Consumption," 1882.

† By means of inhalation-respirators.

‡ "Diseases of the Lungs," p. 884.

Dr. Frederick Hicks, when resident medical officer to the Brompton Hospital, in a communication to the Harveian Society, spoke thus of his own personal experience: "To obtain the greatest good from antiseptic inhalations, a patient must devote himself very thoroughly to the treatment. Respirators should be worn almost continuously. . . . All patients testified to their use in allaying cough. This effect might be due to merely a sedative action, but also the more probable explanation was that the antiseptic caused diminution of the irritating qualities of the sputum. If this were so, then antiseptic inhalations were rendering a real service in therapeutics."

Professor M'Call Anderson, Dr. J. Solis Cohen, of Philadelphia, Dr. Kay Shuttleworth, of San Remo, Professor Dreschfeld, Professor Semmola, Dr. Coghill, of Ventnor, Sir Wm. Roberts, Dr. Dujardin-Beaumetz, Dr. Shingleton Smith, Mr. Mayo Robson, of Leeds, Dr. Solomon Smith, of Halifax, and many others, have testified to the value of antiseptic inhalations in phthisis.

Professor Oertel says * :—

"Disinfecting antiseptic treatment is urgently indicated in all advanced forms of phthisical and tuberculous disease of the respiratory organs. In the treatment of the most simple wound or external ulcer we cleanse them with the most scrupulous care, and apply antiseptic dressings, while in this frightful disease the whole surface of the respiratory tract is covered with decomposed secretions, septic pus, and with milliards of fermentive bacteria, which may exercise unhindered that influence over extensive tracts of the most vital organs which we try earnestly to avert from the slightest wound.

"A part of our task in the treatment of pulmonary phthisis is to check these processes; and we have no better means of doing this than the energetic use of disinfecting and antiseptic methods by means of the inhalation of the vapours and pulverised solutions of

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* "Respiratory Therapeutics": Author's translation.

these agents. By reducing these injurious processes, we shall always be able to confine the disease itself, or rather the complex pathological processes of which it consists, within narrower limits, and to lessen their influence upon the diseased organism as much as possible, even though we have not hitherto succeeded in assailing the disease itself in its essence by any kind of therapeutic treatment."

The following are the chief volatile antiseptic substances that have been used recently for inhalation: carbolic acid, creasote, turpentine, terebene, sanitas oil, camphor, iodine, thymol, menthol, iodide of ethyl, eucalyptol, oleum pini sylvestris, and iodoform dissolved in ether.

Any of these may be used of suitable strength, either alone or in combination. They may be used in the "dry" form: that is, dropped on the dry sponge or tow of an inhalation-respirator; or in the form of a steam spray, by means of a Siegle's spray-producer; or they may be diffused through an apartment by wetting cloths with them, and suspending them in the room, or by pouring them on hot water, or placing them on heated plates, or by playing a hand-spray about the room—these and various other simple ways will suggest themselves to everyone.

We find equal parts of creasote and spirit of chloroform, or equal parts of carbolic acid and spirit of chloroform, on the whole, the most useful; but some patients much prefer the eucalyptol vapour. Iodine we have found very useful in some cases where the creasote vapour had but little effect.

Dr. Coghill recommends for inhalation a tincture of iodine made with sulphuric ether instead of spirit of wine, and he prescribes also a combination with carbolic acid, according to the following formula:—

℞ Tincturæ iodi ætherialis ... ... } āā 2 drams.
Acidi carbolici ... . }
Spiritus vini rectif.... ... ...ad 1 oz.
M. ft. inhal.

As to the best method of inhaling these vapours.

Of the perforated zinc inhalation-respirator devised by us for this purpose, and described at vol. i. p. 499, Dr. S. Solis Cohen says: "The lightness of this appliance, its cheapness, and its cleanliness commend it as the best device for the purpose offered to the profession." "It is one of the most useful, as it is one of the simplest, devices for the inspiration of medicinal vapours." *

It has been stated, with much pretence to experimental accuracy, that in such inhalation-respirators no appreciable or useful amount of the antiseptic substances could ever reach the lung. To test this statement, we had some careful observations made with regard to the vaporisability of carbolic acid in continuous inhalation; and Dr. Coghill, at our suggestion, also instituted some careful test observations of the behaviour of several antiseptic bodies in these respirators.

In our own observations, with the inhalation-respirator described, we ascertained that 2·5 grains of carbolic acid (mixed with twice its weight of spirit of chloroform) can be vaporised per hour; so that, if worn twelve hours out of the twenty-four—and many patients wear them all night—30 grains of carbolic acid will be diffused into the air respired. It is easy enough, by various methods, to charge the air inspired with a larger quantity of carbolic acid, but for continuous inhalation many patients cannot tolerate a higher proportion.

When the inhalation-respirator is not worn at night, a ready method of developing vapour of carbolic acid, or any other volatile antiseptic, around the patient is to pour it on an ordinary hot-water plate that has been filled with boiling water, and place it by the bedside.

Dr. Coghill's observations † were made with the assistance of Mr. Sagar (the dispenser of the Royal

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* Hare's "System of Practical Therapeutics," vol. i. p. 829.

† Presidential Address delivered at the Annual Meeting of the Southern Branch of the British Medical Association, 1885.

National Hospital, Ventnor), with his own oral respirator and our oro-nasal respirator; and we give a few of the results. For the rest, we must refer to his interesting paper.

> "*The first series* consisted of five subjects inhaling for half an hour with 50 grains each of the antiseptics, except creasote, which had to be reduced to 25 grains on account of fluidity and slow evaporation. There were seven independent experiments in each material. Temperature of room, 63·7° F.
>
> 1. *Tr. iodi ætherialis*, with oral inhaler, 81 per cent. was volatilised; with oro-nasal, 65 per cent. Average, 76·6 per cent.
> 2. *Sp. chloroform cum phenol. abs.*, equal weights, with oral inhaler, 41 per cent. was volatilised; with oro-nasal, 31 per cent. Average loss, 38 per cent.
> 3. *Sp. chloroform cum eucalyptol*, equal weights, with oral inhaler, 65 per cent. was volatilised; with oro-nasal, 53·5 per cent. Average loss, 61·9 per cent.
> 4. *Sp. chloroform cum camphor*, equal weights, with oral inhaler, 34 per cent. was volatilised; with oro-nasal, 22·5 per cent. Average loss, 29·7 per cent.
> 5. *Creasote* (Beechwood), with oral inhaler, 4·6 per cent. was volatilised; with oro-nasal, 4 per cent. Average loss, 4·4 per cent.
>
> *The second series* of experiments with three subjects inhaling through the oral respirator 50 grains of the following formula, now much used in my hospital and private practice:—
>
> ℞ Eucalyptol ... ... } āā 1 dram.
> Chloroform. pur. ... ... }
> Phenol. absol. ... ... } āā 2 drams.
> Creasoti ... ... }
> M.
>
> Gave the following results:—
>
> No. 1, at a temperature of 64, and vital capacity of 55, evaporated 20 per cent.
> No. 2, at a temperature of 68, and vital capacity of 82·5, evaporated 22 per cent.
> No. 3, at a temperature of 68, and vital capacity of 83·5, evaporated 23 per cent. Average, 21·7 per cent.

These observations of Dr. Coghill, as well as our own, give a complete refutation to the statement that the quantities of the inhalent given off by such respirators are too small to have any remedial effect; indeed, Dr. Coghill has found that great caution requires to be taken with iodine for purposes of inhalation. There seems to be a tendency for it to induce slight hæmoptysis, so as to colour the sputa in tubercular cases when used too freely. But in purulent bronchitis, bronchorrhœa, and broncho-pneumonia it will be found safe and efficacious.

The *inhalation of* **iodine** *vapour*, diffused in greater or less proportions through the respired air, is quite an old expedient in the treatment of phthisis, and it is thought by many that much of the value of applications of iodine to the surface of the chest is due to the inhalation of the vapours given off. We have already quoted a formula for the inhalation of iodine in combination with other antiseptics. S. Solis Cohen considers the inhalation of *ethyl iodide* one of the best means of conveying iodine into the air-passages. He uses it sprinkled on the sponge of the open zinc inhalation-respirator we have devised, and have figured at vol. i. p. 499. He considers it of "special benefit in ulcerative laryngitis, and in assisting the disinfection and healing of pulmonary cavities." *

But many of these antiseptic substances have been administered in other ways. **Iodoform** has been largely given internally as well as by inhalation in phthisis. Dr. Dreschfeld, of Manchester, was one of the first to advocate its use. He gave it in the form of pills (iodoform 1 grain, croton chloral 2 grains, creasote 1 minim), and inhalations (iodoform 20 grains, oil of eucalyptus 20 minims, or creasote 10 minims; rectified spirit and ether, each ½ an ounce). If the pills were not well borne, it was given in cod-liver oil. He suggests also that in the case of young children it may be used as an inunction, made with olive oil or vaseline. He found older children took it well in powders or pills. In laryngeal phthisis he thought it very useful, especially when applied locally to the ulcers in the form of powder. The results of his observations were that it produced (1) increase of weight; (2) increase of appetite; (3) diminution of cough and expectoration; (4) diminution, or even total cessation, of night sweats; (5) frequently some reduction of temperature.

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* Hare's "System of Practical Therapeutics," vol. i. p. 829.

Dr. Shingleton Smith, of Clifton,* has published cases which show that under the influence of iodoform, often the bacilli in the sputum diminish in number, and disappear. In several, all active symptoms subsided and expectoration ceased. He thinks iodoform has a deleterious influence on the bacillus of tubercle, and that its utility in phthisis is due to its germicide action. He considers that many cases of advanced phthisis were arrested by its use, and that incipient cases were cured.

Professor Semmola has also given iodoform internally in phthisis, and has found it curative in some early cases and remedial in advanced cases, lessening the expectoration, moderating the cough and fever, arresting caseation, and prolonging life. Wilson Fox had obtained "favourable results" with it "in a few cases." †

Dr. Shingleton Smith, while admitting there is difficulty in digesting this drug, points out the probability that it prevents self-inoculation of the intestine by means of the bacilli-loaded sputum, which must be swallowed; and he rightly insists on the necessity of disinfection of the contents of the alimentary canal, to prevent local infection by the passing sputum, or still further infection from the discharges of existing ulcers.

He has given the drug in doses varying from 1 to 5 or 6 grains five times daily. He thinks 30 grains daily is the limit beyond which it may not be safe to go.

We have ourselves found iodoform of great service in many cases, but given in pills, we have found it very badly tolerated by some patients, on account of the gastric irritation it has excited. In small doses, however, in combination with guaiacol and sweet almond oil, or mixed with cod-liver oil, we have found it well borne. We have found children take it exceedingly well mixed with cod-liver oil, in the proportion of ½ a grain to 2 drams of the oil, and we have found adults take it for long periods without any difficulty when given mixed with guaiacol and almond oil in capsules, which should be taken immediately after food, or if at other times, with a tumblerful of milk. We shall again allude to this combination of iodoform and guaiacol.

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* International Congress at Copenhagen.

† "Diseases of the Lungs," p. 871.

The use of **benzoate of soda** as an antiseptic and anti-parasitic agent in the treatment of phthisis was founded on observations by Schüller, who, after producing artificial tuberculosis in rabbits, asserted that he had succeeded in curing the tuberculous manifestations by causing the animals to inhale a solution of benzoate of soda in a certain definite proportion to their body weight (1 in 1,000).

Rokitansky applied this principle to the treatment of phthisis in the human subject, and published his conclusions, which were to the effect that benzoate of soda was indeed a cure for this disease.

These somewhat rash and hasty conclusions did not bear the test of further examination.

Oertel's observations with the same agent led him to the conclusion that—

"By inhalations of such large quantities of a powerful anti-parasitic and antiseptic agent, especially in concentrated solutions, we not only obtain a far more thorough cleansing of the air-passages, the bronchiectatic dilatations and cavities than has hitherto been effected, but mycotic processes and decomposition of the secretions are arrested by the increased expectoration accompanying the inhalations and by specific action of the remedy itself, and thus the absorption of poisonous substances is also checked.

"Besides, the patients are also compelled to swallow the large quantities of the fluid deposited in the oral cavity, so that in this way also a considerable amount of the benzoate of soda penetrates into the body. This may account for the diminution of fever, lowering of the temperature, and reduction of pulse-frequency."

From our own observations, we are led to the belief that benzoate of soda has a good effect on infective catarrhs of the respiratory mucous membrane, and we have seen its use in whooping cough attended with remarkable benefit. In advanced phthisis, its inhalation in a five or ten per cent. solution by means of a Siegle's steam spray-producer will, we believe, be found to have useful soothing and cleansing effects.

No other antiseptic has met with such general acceptance and approval in the treatment of phthisis as **creasote**, and now its derivative, **guaiacol**,* is largely used in its stead. It has been employed in the treatment of phthisis for many years, and may be regarded as a direct descendant of the old *tar* treatment, so much in vogue in the last century. Of late years it has steadily gained in favour, and is now perhaps more widely used in every country in the world than any other remedy for phthisis. The advocacy of Bouchard and Gimbert in France, a few years ago, gave a great impetus to its adoption in that country as a remedy for pulmonary tuberculosis. They published the details of a large number of cases in which they had given it, and the results were regarded, on the whole, as unusually favourable. They urged the necessity of using the pure wood creasote, obtained by distillation from the tar of the beech-tree.†

Professor Jaccoud, who is a warm advocate of the creasote treatment, believes—as we do—that creasote exerts a curative influence on the tubercular lesions in the lungs *by promoting sclerotic changes.* It diminishes the expectoration, lessens its purulency, and removes any fœtor it may possess; it reduces the extent of the catarrhal lesions, and so reduces considerably the area of the pulmonary changes. It lessens the tendency to hæmoptysis. It tends to clean the tongue, and promotes appetite and the capacity of taking food by its stimulating action on the stomach. Some patients object greatly to its taste, and in some few cases it seems to set up gastric irritation. It has been given in many different forms; one of the most popular is in capsules, alone, or mixed with cod-liver oil. Capsules of 1, 2, or 3 minims may be given when the stomach contains food, or they may be washed down with a teacupful of milk, three or four times a day; or flexible capsules can be obtained, each containing a minim of creasote mixed with 5 or 10 minims of cod-liver oil. From five up to twenty such capsules may be taken in the course of the day, after food, or with a draught of milk. *Guaiacol* may be given in precisely the same way, and a quarter of a grain of iodoform may be introduced into each capsule; and the latter drug seems to be better tolerated in this form than in any other. Bouchard has pushed the dose of creasote to 40 minims (mixed with cod-liver oil) daily for several consecutive days. It has also been given in the form of "*wine of creasote*," which is made by mixing 1 dram of creasote with 2 drams of tincture of gentian, 2 ounces of brandy, and 10 ounces of Malaga wine. From two to four tablespoonfuls are given in the day, each mixed with a glass of water. It is best to begin with a small dose, and increase it gradually. Jaccoud also gives it mixed with glycerine and brandy or rum. Dieulafoy, Dujardin-Beaumetz, and Germain Sée agree in laudation of its effects; and the latter—like Jaccoud—believes it exercises a direct effect on the local lesion. We have found the following a useful formula for those who do not object greatly to the taste of the drug:—

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* Creasote of the beech-tree contains 60 to 90 per cent. of guaiacol.

† Coal-tar creasote—the false creasote of commerce—is detected by pouring a little of a solution of perchloride of iron on a very dilute alcoholic solution of creasote; the false creasote gives a *blue* colour, which changes to and remains *violet;* the *true* creasote gives a *green* colour, rapidly changing to brown.

℞	Pure creasote (or guaiacol)	48 minims.
	Glycerine	2 oz.
	Tincture of orange peel	to 3 oz.

One teaspoonful (2 minims of creasote) in a large wineglassful of milk and water, or in a little weak brandy and water, three or four times a day soon after food.

It has recently been urged that it is important to *saturate* the system with creasote (or guaiacol), and it has been administered in many other ways than by inhalation and by the stomach. A mixture of creasote and cod-liver oil—one dram of the former to one ounce of the latter—has been ordered to be rubbed into the back, the chest, and the armpits on going to bed every night, and at the same time the nostrils are to be plugged with small indiarubber tubes, each containing a curl of blotting-paper saturated with creasote.

It has been injected into the lungs, at the seat of the lesions (the apex), with an ordinary hypodermic syringe, most minute antiseptic precautions being taken: 10 minims of a three per cent. solution in sweet almond oil have been slowly injected every two or three days, with a markedly beneficial effect on the general symptoms and the local lesion. It has been administered by enemata. It has been injected subcutaneously: 5 to 10 drams of a mixture of 2 drams of creasote and 4 ounces of almond oil have been injected into the lumbar region every second day.

Dr. Picot, of Bordeaux, has obtained excellent results from the hypodermic injection of guaiacol, 5 centigrammes, and iodoform, 1 centigramme, mixed with a cubic centimetre of sterilised olive oil and fluid vaseline.

He injects three cubic centimetres of this liquid into the subcutaneous tissue of the supraspinous fossa daily. This is a large quantity to inject (45 minims), and we have found that a much more concentrated and smaller injection is quite as unirritating and quite as effectual. Iodoform ½ grain, and guaiacol 3 minims, mixed with 20 minims of sterilised almond or olive oil, for each injection, is a more convenient form. But patients do not like these daily punctures, and we have had capsules prepared, each containing $\frac{1}{4}$ grain of iodoform, $1\frac{1}{2}$ minim of guaiacol, and 3 minims of cod-liver oil—one or two of those may be taken twice or thrice daily, washed down with a wine-glassful of milk and water after food. We have found the French capsules of *morrhuol creasoté*, prepared by Chapoteau, exceedingly well tolerated by patients, and we think them very useful, each capsule containing a grain of creasote.

We are convinced of the efficacy of creasote and its derivative, guaiacol, in arresting the progress of phthisis in many cases, and its efficacy is not limited to early cases, but it is also of great use in many chronic forms. It does not cure incurable cases, as some would seem to expect, but if properly, adequately, and carefully administered, it does as much in the way of remedying them as seems possible. How it acts it seems premature to determine. It is known that the bacillus of tubercle can with difficulty be cultivated in sterilised blood serum containing $\frac{1}{4000}$ its volume of creasote; and it seems possible that even in moderate doses it may render the lung tissues a less favourable culture medium for this microbe.

There is yet another method of administering creasote, recently introduced by Professor Germain Sée, which claims a brief notice. It is the combination of the inhalation of creasote vapour with compressed air. The patient is introduced into a compressed air cabinet containing fumigations of creasote and eucalyptus, and he has to remain there from three to six hours daily. This combination, according to Professor Sée, causes an "enormous absorption of creasote * by the whole pulmonary surface, diseased and sound." The beneficial effects appear to have been in some cases very remarkable. Professor Sée considers it a "true general antiseptic, acting especially on the broncho-pulmonary surface." Dr. Tapret states that in six out of thirty cases submitted to this treatment the bacilli disappeared from the sputum.

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* The air which is pumped into the cabinet to augment the pressure is passed through a mass of shavings saturated with creasote, and is made to take up 1 milligramme of creasote to each litre. During a *séance* of four hours it is calculated that the patient breathes on an average 1 dram of creasote.

A great number of other antiseptic agents—volatile and non-volatile—have been applied to the treatment of phthisis, and more or less success has been claimed for all of them. Some have had a brief popularity, and have then practically disappeared from use. We shall not occupy space by dwelling on such methods as are already discredited, such as the *Bergeon method*[*] *of administration of a mixture of sulphuretted hydrogen and carbonic acid gases* by the rectum; the *inhalation of hydrofluoric acid*;[†] the inhalation of *super-heated air*;[‡] the hypodermic use of *cantharidinate of potash*.[§] There is no reason to doubt the good faith of those who have recorded beneficial effects as following each of these methods, but the weight of evidence is against their usefulness being as great as that of other methods which have not the same drawbacks.

The inhalation of *turpentine* (or terebene) is of value in relieving the catarrhal conditions accompanying phthisis, and so diminishing cough and expectoration; it may be used alone or combined with carbolic acid, eucalyptol, chloroform, or camphor, in the inhalation-respirators already referred to. *Chloroform* is often a valuable addition to many of these antiseptic inhalations. It is itself a powerful antiseptic, and by its ready volatility may help to convey the vapours of the other less volatile antiseptic deep into the air-passages, while its sedative effect is valuable in allaying irritative cough.

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[*] We described this method fully in the *Lancet* of April 16, 1887.

[†] This method was warmly advocated before the *Académie de Médecine*, of Paris, by Prof. Hérard, and is fully described by Dujardin-Beaumetz in his "Clinique Thérapeutique," vol. ii. p. 632, and in Hare's "System of Practical Therapeutics," vol. i. p. 831.

[‡] Many writers, and especially Dujardin-Beaumetz, report unfavourably of this method. (*See* "Year-Book of Treatment," 1889, 1890, and 1891.)

[§] *See* "Year-Book of Treatment for 1892," pp. 73 and 456.

Camphor has also been found useful in phthisis, in the form of subcutaneous injections—1 part dissolved in 9 parts of olive oil: 15 minims of this solution being injected at a time. It has been found especially valuable at the period of softening, and the formation of cavities with hectic and night sweats; the latter soon disappearing with its use. It has also diminished cough and expectoration, improved the appetite, increased the strength, and induced calm sleep. It has been advocated as the best treatment in the third stage, soothing symptoms and prolonging life. It is accumulative, however, and must not be repeated too rapidly.

Eucalyptol is also given hypodermically mixed with sterilised olive oil, in the proportion of 1 to 4. Fifteen minims of this mixture are injected daily. It controls septic and febrile conditions, and diminishes cough and expectoration.

Monochlorophenol, a substance recently obtained by Tacchini, a chemist of Pavia, has been reputed to be a very valuable volatile antiseptic, from the inhalation of which excellent results have been secured in the early stage of phthisis. It is free from the disagreeable odour and irritant action of trichlorophenol; it is very volatile, and, as its vapour is heavier than air, it penetrates to the remotest air-passages. It has been found also distinctly remedial in advanced cases, and it is said to diminish the number of bacilli in the sputum.

Menthol mixed with olive oil (1 in 10) has been administered by *intralaryngeal* injections. The nozzle of the syringe is introduced between the vocal cords, and as much as a dram at a time of this mixture injected twice a day.

Byrom Bramwell, who has published some excellent results from this treatment, states that "after the first few injections the irritability of the throat and pharynx subsides, and the injection gives rise to no discomfort, and to little or no cough," provided the operation be skilfully performed. It must be remembered that menthol is a powerful *anæsthetic* as well as an antiseptic.

Of *aristol* (a combination of iodine and thymol) a 1 per cent. solution in almond oil has been injected subcutaneously (Nadaud) in phthisis—first 15 minims, then 30, and then 45 minims daily—and the treatment has been more or less prolonged, according to the state of the patient. It is said to be eliminated by the lungs after six or seven days, and its use has been attended with diminution of cough, suppression of night sweats, increase in weight, and apparent cure in about one-third of the cases treated by it.

Myrtol, given in capsules, 2 grains in each, two every second hour, has been found by Eichhorst to influence favourably the course of pulmonary tuberculosis, especially when there is evidence of putrefactive processes in the air-passages.

Intravenous injections of an emulsion of *balsam of Peru* and hypodermic injections of the same have been attended by a diminution of the catarrhal symptoms, and in early cases, it has been said, by a disappearance of bacilli from the sputum; but the evidence of this is somewhat feeble.

Chlorine gas, diluted, and *sulphurous acid* gas have both been again brought forward as useful antiseptic inhalations in phthisis, but they are both so irritating to the air-passages of most persons that it is doubtful if they could ever be inhaled in sufficient strength to be of any permanent use.

Inhalation of ozonised oxygen has been commended by Ransome as attended by suppression of fever and night sweats, diminution of expectoration, improvement in appetite and sleep, and gain in weight.*

A knowledge of the powerful microbicide properties of certain preparations of mercury has led to their employment as antiseptic agents in the treatment of phthisis. Drs. Rueff and Miguel especially have most perseveringly applied the method of inhalation of pulverisations of a solution of *mercuric biniodide* in cases of phthisis in the Rothschild Hospital in Paris. They use the following solution : biniodide of mercury 1 gramme, potassium iodide 1 gramme, distilled water 1,000 grammes. This solution is less caustic than that of the biniodide alone, and much more agreeable than that of the bichloride. They take special precautions to produce a very fine spray, and that the patient should inhale in a manner that will ensure its passing into the finest air-passages. They calculate that at each *séance* 2 milligrammes of the biniodide pass into the lungs, and, as the biniodide is aseptic at 1 in 40,000, this is enough to disinfect 80 grammes of infected sputum, and with two *séances* daily 160 grammes of sputum would be disinfected. The treatment must be persevered in for several months ; 70 per cent. of their cases were benefited. They had three cases of absolute cure, the bacilli disappearing completely from the sputum, and the patients remaining well after three years.

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* *Medical Chronicle*, vol. viii. p. 37, and vol. x. p. 97.

Others have given solutions of bichloride in pulverisation ($1\frac{1}{2}$ grain of bichloride, 1 dram of common salt, and 16 ounces of distilled water), and at the same time $\frac{1}{50}$ grain twice a day by the stomach with " immense improvement."

Calomel has also been given as a "specific antiseptic" in phthisis, in doses of $\frac{2}{5}$ of a grain three to six times a day.

Messrs. Shurley and Gibbes have published a method * of treatment in which they associate the inhalation of chlorine with the hypodermic injection of a solution of *iodine in glycerine* alternately with one of *chloride of gold and sodium.*

They give the solution of iodine at first in doses of $\frac{1}{12}$ grain, and increase gradually to $\frac{1}{2}$ grain or a grain daily. The chloride of gold solution is also given at first in doses of $\frac{1}{30}$ or $\frac{1}{20}$ of a grain, and gradually increased to $\frac{1}{5}$ or $\frac{1}{3}$ of a grain. It is stated that "guinea-pigs treated with these injections become resistant to inoculation with virulent sputum."

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* *Therapeutic Gazette*, April 15, 1891.

Dr. S. Solis Cohen says: "My experience with the method leads me to believe it of decided utility; though I have not satisfied myself that it is superior to other methods, except for hospital patients."* There is a certain amount of technical detail to be carefully attended to, which is described in the references given, but the method has not, as yet, been sufficiently tested to enable us to recommend it strongly.

Tannin has recently been advocated as an antituberculous agent of great efficacy. Rabbits, it is said, impregnated with tannin become insusceptible to inoculation with tubercle. It may be given to adults dissolved in glycerine and wine: Tannin 80 grains, glycerine 1 ounce, wine a quart; a claret-glassful is given after each meal. It has also been given in cachets, 15 grains, thrice daily.

Whitla states that he has tried it with negative results. Some give it combined with iodine in syrup, and others with creasote in pills. It is in early and acute cases that it is said to be chiefly applicable. We are disposed to regard it as a remedy meriting further trial, more especially as it is quite harmless and easy of administration.

Intrapulmonary injection of several of these antiseptic substances (creasote, a 3 per cent. solution in almond oil; carbolic acid, a 2 per cent. solution in glycerine; iodoform in olive oil; iodine in weak solution; mercuric chloride in weak dilution; iodine and carbolic acid combined; camphor and carbolic acid combined; camphorated naphthol) has been practised by many physicians, but serious accidents have occasionally attended this method of treatment, and the benefits resulting from it have not been sufficiently great or lasting to recommend it for general adoption. The practicability of *intratracheal* injections of antiseptic fluids (after *cocainisation* of the larynx) has recently been established, especially by Masini, of Genoa, who has devised a special syringe for the purpose; and it is possible that further observations may prove this method to be a good way of administering them.

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* Hare's "System of Practical Therapeutics," p. 876.

Tuberculin.—This substance, introduced by R. Koch as a specific and secret remedy for phthisis, in the autumn of 1890, has since been announced to be a glycerine extract of the products of the cultivation of the tubercle bacilli. It was stated by Koch that it acted in a specific manner on tubercle, exerting a selective action upon it, hastening its disintegration, and under appropriate conditions led to the cure of phthisis. The excitement throughout the medical world at this announcement was intense, and the scenes in Berlin which followed, and which we had the opportunity of contemplating, were perhaps the most remarkable in the history of medical science. This is not the place to write the history of that extraordinary and unfortunate announcement. Those who saw, as we did, the severe reactions which followed, in many cases, the subcutaneous injections of tuberculin, felt that there must be serious risks attending its general use, and that, like most other remedies for phthisis, it could only cure in *curable*—that is, in carefully selected—cases. But it soon became clear that a reprehensible haste had been manifested in the promulgation of the conclusions to which Koch had been prematurely led. The cardinal point in his preliminary statement was that guinea-pigs could be rendered immune to inoculated tubercle by this substance; but even this assertion has been seriously called in question by other observers. It was not long before a sense of profound disappointment succeeded to the enthusiasm excited by the exaggerated statements that had been promulgated; this reversion of feeling was started by the reports of Virchow and others, supported by many pathological facts, that treatment by tuberculin was attended by serious risks of dissemination of the tuberculous virus throughout the body, by the softening and disintegration of quiescent deposits, roused into activity by the severe inflammatory action excited around them. Much discussion followed, and the final result was that the remedial action of tuberculin, not only in phthisis, but in tuberculous diseases generally, became utterly discredited, and its use almost universally abandoned. Whether its use will ever be revived, in some modified form, based on such analytical researches into its composition, and the practicable separation of its constituents, as those of Hunter and Watson Cheyne,* it is scarcely possible to say. We must not, however, withhold our own testimony to the fact, that in certain carefully selected cases of phthisis, and with a very careful use of tuberculin in minute doses, we obtained some excellent results: better than we have been accustomed to encounter from any other form of treatment in so short a time; and if we no longer use it, it is in deference to the alarm and distrust of the remedy, aroused by its antagonists, in the minds of the profession and the public; for, hastily and prematurely advocated, it has been hastily, unwisely, and almost angrily denounced.

The injection of goat's blood and dog's serum in phthisis.—It is stated that dogs and goats (?) are immune to tuberculosis infection, and that rabbits are rendered immune by the injection of dog's blood. Upon these statements has been founded the application of subcutaneous injection of goat's blood and dog's serum in phthisis. Semmola† has published good results from the use of the latter, which he considers should be preferred to goat's blood, as dogs are absolutely insusceptible to tubercular infection, while the goat is not. We await further and more general application of these methods before attempting to pronounce a judgment upon them.

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* *British Medical Journal*, July and August, 1891.

† Supplement to *British Medical Journal*, Aug. 22, 1891.

The **alkaline hypophosphites** are of considerable value in a certain number of cases of phthisis. In advanced cases, with both lungs involved, they *can only* act as general tonic remedies, and this they will do in certain instances when there is no great amount of general cachexia. In acute febrile cases running a rapid course they are useless. They will often be found of great, though temporary, benefit to fair, florid *young* persons who are the subjects of chronic phthisis. They are of much less use to old than to young people; but to young children, in almost all forms of chronic lung disease, they prove of the greatest service; and especially in the chronic bronchial catarrhs of scrofulous children.

In the cases in which they do good their beneficial effect is generally noticed almost immediately. Patients usually say they feel very much better "in themselves"; they feel stronger, in better spirits, are more active, eat better, and sleep better. The night sweats disappear, the cough sometimes disappears also. But, notwithstanding the evident improvement in general health, the physical signs often remain the same, and the amelioration which follows the use of the hypophosphites is, in many cases, only of temporary duration. Patients who are mending under the influence of these remedies should be protected with more than usual care against all those conditions which may possibly lead to a relapse.

The hypophosphite of lime is the preparation we have found most useful. After giving it in various forms and doses, we find the following formula the best:—

℞	Calcis hypophosphitis	3 grains.
	Glycerini	20 minims.
	Tincturæ quassiæ	10 ,,
	Syrupi aurantii	30 ,,
	Aquæ	ad ½ oz.

M. To be taken three times a day an hour after food.

For young growing children a combination of the hypophosphite of lime and the syrup of the phosphate of iron, acts much better than the lime salt alone.

The following formula is calculated for children from eight to ten years of age :—

℞ Calcis hypophosphitis	$1\frac{1}{2}$ grain.
Syrupi ferri phosphatis	30 minims.
Syrupi simplicis	30 ,,
Aquæ destillatæ	ad 2 drams.

M. Three times a day after food.

Van Abbott's biscuits, each containing 5 grains of hypophosphite of lime, we have found useful for children.

Arsenic, as a remedy for phthisis, has been greatly extolled, especially by French physicians. Jaccoud says "it is *infallible* in its restorative effects" if long persevered in, and that it leads to retrocession of the local lesions. He gives 1 milligramme (about $\frac{1}{60}$ grain) of arsenious acid in pilules (*well-prepared and readily soluble*), twice a day at the commencement of a meal, and increases the dose gradually up to 1 centigramme daily; he continues this dose until signs of intolerance show themselves, the chief of which is great feebleness of the lower extremities and great lassitude after walking. He then greatly reduces the dose, and again slowly increases it. Moutard-Martin thinks it most useful in the *torpid* form of phthisis. He has observed both local and general amelioration follow its use. Hérard and Cornil complain that *arsenic* does not occupy the rank it merits in therapeutics; they think it has both a local and general good effect in pulmonary tuberculosis: they consider it lessens congestion by its influence on the ganglionic nervous system, and so remedies the hyperæmia and inflammations which develop around tuberculous granulations.

Fonssagrives approves of arsenic in the form of arseniate of soda, of which he gives $\frac{1}{26}$ of a grain in a tablespoonful of water twice or thrice daily.

Dujardin-Beaumetz says: "I am one of the warmest partisans of the arsenical treatment, and I have myself seen some marvellous results from it."

We see here a remarkable unanimity on the part of French physicians as to the value of arsenic in phthisis.

Ringer considers he has seen children "with severe tuberculosis, involving lungs, intestines, and peritoneum, steadily and slowly improve, and ultimately recover under arsenic;" and he has seen "a like result in adults in phthisis in the subacute and chronic forms." Bartholow considers "we have no single drug of equal utility in the chronic forms of phthisis," but it is useless in cases with "much hectic and rapid degeneration of the pulmonary tissues."

We have not ourselves observed any such brilliant results from *arsenic*, but it is always worth a trial, especially in chronic cases, with accompanying bronchial catarrh. We have not found it of any great value in the more acute forms, nor in those in which there is a very decided hereditary predisposition, nor in others with a tendency to gastro-intestinal catarrh; but we have found it useful in some chronic forms, and especially in those which appear to have had their starting-point in catarrhal and congestive attacks of one apex with pleuritic adhesions, often coinciding with rheumatic tendencies. Given, in combination with alkalies (as in the Bourboule water), we have found it beneficial in relieving the catarrhal symptoms and improving the general health.

As to the value of **iron** in the treatment of phthisis, many differences of opinion have existed, but there is a general agreement that it must not be given where a tendency to hæmoptysis exists. In such patients the cardio-vascular system is often very excitable, and the administration of iron by stimulating the cardiac irritability may be the means of inducing that hæmorrhage which it is one of our main objects to avoid. But in some of the subjects of chronic phthisis, especially in poor anæmic and underfed patients, the value of an iron tonic is remarkable, and it may be given, with advantage, for long periods at a time.

A good form for this class of patients is the following :—

℞ Liquoris ferri perchloridi ... ... 20 minims.
Spir. chloroformi ... ... 10 „
Infusi quassiæ ... ... ad 1 oz.
½ oz. or 1 oz. for a dose.

The stronger preparations of iron are not, however, well borne by the better-fed and more delicately nurtured subjects of phthisis, nor is it suitable to febrile or dyspeptic cases. It is in the torpid, chronic forms of phthisis, attended with profuse expectoration from co-existing bronchial catarrh, that the above mixture is so useful.

A good form in which to administer iron to phthisical children and young adults is the well-known compound syrup of the hypophosphites : a teaspoonful twice a day an hour after food.

For scrofulous young people the syrup of the iodide of iron is the best form to prescribe, in half a teaspoonful or teaspoonful doses, after food, twice or three times a day.

Cod-liver oil is a valuable remedy for phthisis under certain conditions. It is especially useful in the treatment of the poor and ill-fed ; it supplies the place of food in such cases. It is not, however, so much the practice now, as it once was, to order *all* phthisical patients to take this oil as an essential and indispensable part of their treatment, as it is certainly possible to find other means for maintaining and augmenting the nutrition of the body. Most English physicians also give it in smaller doses than they used to—two teaspoonfuls twice a day is now an average dose. It is always a favourable point in the case, if the patient takes the oil willingly, and digests it easily ; for this indicates a satisfactory state of the organs of digestion and the absence of fever. Cod-liver oil is ill borne, and therefore of little use in cases of febrile phthisis. The absence of fever and the quiescence of the local affection favour its digestion and absorption. On the other hand, gastric debility or the existence of gastric or intestinal catarrh, so common in the more active forms of phthisis, and sometimes associated with the chronic form, counter-indicates the use of the oil, or calls for its suspension. As a good *general* rule, we should prescribe cod-liver oil in all cases in which it is certainly well borne and easily digested, and we should withhold it in all cases in which it is ill borne and digested with difficulty. In children and young people, especially if they present signs of the scrofulous constitution, we should urge its use, and not allow it to be hastily set aside. Where it agrees well its good effects are soon manifested in increase of appetite, improved vigour, greater capacity for exertion, and increase in body-weight.

As a prophylactic, its regular use in small quantities should be urgently recommended for all young, delicate, and scrofulous children. If its use is begun when the children are very young, we rarely find any objection made to its taste in after-years, so that a tolerance of the remedy is early established.

The difficulty which some patients experience in taking the oil has led to many practical suggestions as to the best mode of giving it so as to overcome the repugnance felt to it.

We have found in cases where there has been no objection to the taste of the oil, but a good deal of discomfort caused by its "repeating," that the oil made into a partly saponified emulsion will often be well borne and digested.

We have used the following form largely :

℞ Cod-liver oil	1½ oz.
Solution of potash (or soda) ...	80 minims.
Strong solution of ammonia ...	4 ,,
Oil of cassia (or lemons)	2 ,,
Simple syrup	½ oz.

Of this mixture from three to four teaspoonfuls may be given as a dose.

A great number of emulsions of cod-liver oil are now prepared, and many of them are well made and more easily digested by some patients than the pure oil.

Glycerine has been regarded by some physicians, and especially by Jaccoud, as a good substitute for cod-liver oil, when the latter cannot be taken. Jaccoud maintains—and he is supported by Germain Sée in the statement—that glycerine acts as an important aid to nutrition, promoting assimilation and lessening waste (increasing the amount of carbonic acid expired, and lessening the amount of urea secreted), and so causing a gain in body-weight during its use. As glycerine is an alcohol, and, like other alcohols, capable, when taken in excess, of producing intoxication, it is necessary to regulate carefully the dose. Jaccoud gives from 10 to 15 drams per diem; he has found the larger dose occasionally cause an elevation of temperature, and then he has fallen back on the smaller dose. He is accustomed to add two teaspoonfuls of rum or brandy and a drop of essence of peppermint to each dose, simply to give it an agreeable taste. He states that he finds distinct advantage in giving this to all his phthisical patients who cannot take, or who are tired of taking, cod-liver oil.

The use of mineral waters and inhalations of nitrogen.—The treatment of phthisis is undertaken at many Continental spas, and, although the evidence at our command on this subject is unusually conflicting, we cannot pass over in silence methods of treatment which have so many advocates.

The following comprise the chief spas which have been recommended for the treatment of phthisis:

1. *Sulphur springs,* as Eaux Bonnes, Cauterets, St. Honoré, etc.

2. The *alkaline bicarbonate* of soda waters—most of them containing also small quantities of chloride of sodium—as Ems, Salzbrunn, Neuenahr, Gleichenberg.

3. The *arsenical* waters, as La Bourboule, Mont Dore, Royat. These also contain bicarbonate of soda and chloride of sodium, like the second group.

4. *Saline, or common salt waters*, as Soden, Reichenhall, Salzungen, Kreuznach.

5. *Sulphur and salt combined*, as Uriage, Aix-la-Chapelle, etc.

6. *Lime waters*, as Weissenberg and *Lippspringe;* this last, together with *Inselbad* (near Paderborn), are employed for the free *nitrogen* they contain, which is used for inhalation; and it will be convenient to dispose of this matter first: viz. the effect of the **inhalation of nitrogen** in phthisis.

The gases which are disengaged freely from the waters at Lippspringe, and from the Ottilien-Quelle at Paderborn, are very rich in nitrogen, the former containing 83·25 per cent., and the latter 97 per cent. The dry gas is inhaled by means of a special apparatus with, it is stated, great improvement in the *general* symptoms.

"After inhalations of nitrogen from eight to fourteen days, Treutler observed that the sleep became calm, the appetite increased, the night sweats diminished, and if any diarrhœa existed it was allayed; there was also increase of pulmonary capacity, of body-weight, and, except in desperate cases, of bodily strength and activity. Meanwhile, the fever was variously influenced; in slighter cases it soon disappeared, in others it was sometimes even exaggerated for the first week or two, afterwards diminishing somewhat rapidly or ceasing altogether, while in hopeless cases it was unaffected." *

From cases reported, it would seem as though these nitrogen inhalations had promoted the *softening and subsequent elimination of caseous deposits in the lungs.* After analysing the evidence in their favour, Oertel concludes as follows:—

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* Oertel's "Respiratory Therapeutics" (author's translation), p. 249, where a full description of the mode of giving these inhalations will be found.

"It is difficult as yet to express a decided opinion on the influence of nitrogen inhalations on chronic pulmonary infiltrations, as we have not nearly sufficient observations on the subject to exclude completely all the casualties which always occur in the treatment of pathological processes running so varied a course, and to be able to separate the influence of the various other agents which come into operation. For the present it behoves us to give a fair trial of nitrogen inhalations in the treatment of chronic pneumonia and its products."

Rhoden,* of Lippspringe, however, seems disposed to refer the effects of treatment observed there to the influence of the moist climate, to the inhalation of vapour of water, and to the warm water drunk fasting (containing a considerable quantity of lime salts, and a small amount of sulphate of soda). He thinks these lead to the "frequently surprising sudden" softening of the caseous deposits and their expectoration "up to the line of demarcation, and so that often in a few weeks cavities tending to cicatrisation may be discovered, with diminution of the purulent sputum, provided that the nutrition has in the meanwhile been improved." This explanation may, in part, be extended to all those spas where phthisical patients are submitted in inhalation-chambers to the influence of an atmosphere saturated with vapour of water, and laden also with spray of pulverised water, while they are given, at the same time, a certain quantity of hot water to drink fasting, as at Mont Dore. Doubtless, such treatment is soothing and remedial in certain cases, especially in those associated with dry catarrh, and those in which the disease is not far advanced. Such patients are enabled to breathe deeply in these moist atmospheres without exciting cough, and the amount of vapour of water in the air induces deeper inspirations in order to obtain the amount of oxygen required, and the lungs become more fully expanded, so that air is admitted into portions that may have been little used, and inspiration, therefore, becomes freer; and this is soon attended with an increase of vital capacity and general amelioration. Expectoration is facilitated by the increased supply of water in the air where the climate is a moist one, as at Lippspringe and Ems, and a tendency to the softening and expectoration of caseous deposits, and the formation of cicatrising cavities is induced.

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* "Treatment of Phthisis by Baths and Climate."

That this softening and elimination process, which it is admitted is often attended with some fever, can always be restricted within the desired limits, no one pretends to believe; just as it must also be admitted to be impossible to select only those cases for this treatment, in which perfectly circumscribed masses of caseous infiltration exist in the lungs, in such relation to the surrounding lung tissue, as to make their rapid separation and elimination possible and advantageous. Indeed, in some cases, the excitation of this process of rapid softening has been attended by further diffusion of the disease, the production of high fever and general tuberculisation.* More than ordinary care, therefore, must be necessary in the selection of cases for this mode of treatment.

After elimination of the caseous infiltration and the formation of cicatrising cavities, it is advisable to remove the patient from these moist situations to a more bracing sub-Alpine station, or to other appropriate winter quarters.

The *alkaline bicarbonate of soda waters* are chiefly useful in the treatment of the chronic bronchial catarrh of phthisical patients who are free from fever.

Ems, which was at one time regarded as a suitable resort for such cases, is now universally prohibited in phthisis on account of its situation and climate.

Salzbrunn, in Silesia, 1,220 feet above the sea, and sometimes termed the "cold Ems," is better situated, and forms an appropriate summer resort for cases of old stationary phthisis, associated with catarrhal and dyspeptic symptoms.

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* Just the same as has been observed in the use of tuberculin.

Gleichenberg, in Styria, has also a very mild climate and a moist atmosphere, and the same kind of water as Ems, only more strongly mineralised. Inhalations are practised there, and the place is well adapted to the cases indicated above.

The "*sool*" or *common salt waters*, and the inhalation of the salt-impregnated atmosphere which surrounds the graduation works commonly found at these spas, or of the pulverised saline water in their inhalation-chambers, are useful in the treatment of the chronic bronchial catarrh which accompanies most cases of chronic phthisis. The saline solutions appear to produce a stimulating effect on the bronchial nerves "causing vigorous contraction of the muscles, and thus promoting expectoration"; while the water inhaled "softens the secretions and the epithelium."

The cases which derive the greatest benefit from such establishments as the Reichenhall Inhalatorium, in which the air is strongly charged with saline spray, are "old bronchial catarrhs, bronchial dilatations, and stationary cavities, with abundant secretion."

Sulphur waters have always enjoyed a great reputation in France in the treatment of phthisis, and they appear to have proved of service in suitable cases. The warm springs of Eaux Bonnes, Cauterets, St. Honoré, Amélie, etc., are the most in repute.

In all these spas it is usual to drink a small quantity of the water at first, only 1 or 2 ounces, which is increased when well borne by the patient to two or three glasses a day. In some there are inhalation-chambers filled with the pulverised water, or with gaseous sulphuretted hydrogen, separated from the water by mechanical means, and in these the patients remain for a certain time. Baths, half-baths, foot-baths, and hot douches to the lower extremities are applied in most of these resorts.

The effect of these sulphur waters is considered to be in a special manner *anti-catarrhal*. They both promote expectoration and diminish its quantity. They are considered also to possess anti-scrofulous and anti-lymphatic properties, to act as tonics to the skin (when taken as baths), and to remove that excessive impressionability of the surface so common with the phthisical, and so to protect them from their tendency to bronchial catarrh. And, ultimately, they are believed to have a general stimulating and tonic effect. With some persons they set up digestive troubles and loss of appetite, therefore the stronger waters should always be diluted, either with milk or a little syrup and water.

The sulphur cure is especially suited to cases of phthisis in scrofulous or lymphatic persons: the form that has been termed "torpid phthisis." The general health should not be gravely compromised; there should be an absence of fever; slight febrile excitement is not, however, a counter-indication; but there should be no tendency to congestion or hæmoptysis.

"If it cannot cure in the absolute sense of the word, it places the economy in a condition to resist the spread of tuberculisation, and to prolong the periods of spontaneous arrest. It modifies or causes the expectoration to disappear, which is often profuse and debilitating; and, finally, it is not improbable that this treatment, when combined with inhalations, favours the cicatrisation of small cavities by arresting the secretion from the pyogenic membrane lining them." *

Spas, such as *Uriage*, *Allevard*, etc., whose waters contain chloride of sodium, as well as sulphur compounds, are especially suited to the treatment of those scrofulous forms of phthisis associated with swelling and suppuration of lymphatic glands.

Of the *arsenical springs*, such as Mont Dore, Royat, and La Bourboule, it is only in the latter that arsenic exists in quantity sufficient to induce the belief that this constituent plays an essential part in the effects produced. The Royat and Mont Dore waters are warm, weak, alkaline springs containing a small quantity of chloride of sodium ;* indeed, Royat has been called "the French Ems."

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* Fonssagrives: "Thérapeutique de la Phtisie Pulmonaire." Second edition.

The good results reported to have been obtained in the treatment of certain cases of phthisis at Mont Dore are, probably, referrible, as at other spas where the inhalation of an atmosphere saturated with vapour of water is an essential part of the treatment, to the influence of the methods employed there on the catarrhal affection, on the secretions, and inflammatory exudations which are retained in the air-passages; and it is highly probable that many of these cases have not been truly cases of tubercular phthisis, but chronic catarrhal and congestive conditions of one or other apex, together with apical pleuritic adhesions—a pathological condition not uncommonly encountered, as a result of acute catarrhal attacks in rheumatic subjects. Cases of chronic phthisis in the fairly robust, complicated with a tendency to asthma, are those best suited to the Mont Dore cure.

La Bourboule has been found very useful in the treatment of enlargement of the bronchial glands in strumous children.

ADDITIONAL FORMULÆ.

Arsenic and iron drops in phthisis.

℞ Liq. arsenicalis, 1 dram.
Tinct. ferri malat., 5 drams.
Glycerini, 5 drams.

M. Fifteen drops twice a day after meals. (*Schnitzler.*)

Creasote mixture.

℞ Creasoti pur. (Morson's), 30 minims.
Spirit. cinnamomi, 4 drams.
Tinct. aurantii, 2½ oz.
Glycerini ad 4 oz.

M. f. mist. A teaspoonful in a little water three times a day after food. (*Whitla.*)

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* A full and detailed examination of the processes applied at Mont Dore will be found in the author's work on "Climate and Health Resorts."

Another.

℞ Beechwood creasote, 32 to 80 minims.
Glycerini, 2 to 4 oz.
Tinct. cardamomi, 2 to 4 drams.
Alcohol, 4 to 8 oz.

Mix. Two to four teaspoonfuls in three or more ounces of water three to five times a day after food. (*S. Solis Cohen.*)

Inhalation in phthisis.

℞ Iodoformi, 24 grains.
Creasoti pur., 4 minims.
Ol. eucalpyti, 8 minims.
Chloroformi, 48 minims.
Alcohol. et ætheris q.s. ad 4 drams.

M. f. inhal. (*Robinson.*)

Mixture for phthisis.

℞ Oil of gaultheria, 2 minims.
Creasote, 5 minims.
Donovan's solution, 5 minims.
Cod-liver oil, 2 drams.
Acaciæ
Sugar } a sufficiency.
Water to make an emulsion of half an ounce.

Mix. After meals three times a day. (*S. Solis Cohen.*)

Tannin wine for phthisis.

℞ Acid. tannici, 80 grains.
Glycerini, 1 oz.
Wine, 1 quart.

A claret-glassful after each meal.
(*Raymond and Arthany.*)

Biniodide of mercury spray for inhalation.

℞ Hydrargyri biniodidi, 7½ grains.
Tinct. opii, 2½ drams.
Aquæ destill., 30 oz.

M. To be used as a spray.
(*Miquel.*)

Antiseptic hypodermic injection.

℞ Acidi carbolici, 5 parts.
Eucalyptol, 5 parts.
Iodoformi, 1 part.
Vaselini (liquid) ad 100 parts.

M. (*Meunier.*)

Iodoform and creasote pills.

℞ Iodoformi, ¾ grain.
Creasoti, ¾ grain.
P. benzoini, ¾ grain.
P. bals. tolut., ¾ grain.

To be made into a pill and coated with sugar. Two to four daily. (*Huchard.*)

CHAPTER III.

SYMPTOMATIC TREATMENT OF PHTHISIS.

Counter-irritation—Flying Blisters—Iodine—Paquelin's Cautery. *Treatment of Fever*—Quinine—Digitalis—Salicylic Acid and Sodium Salicylate—Antipyrin—Phenacetin. *Treatment of Night Sweats*—Different Forms of Sweating—Hypophosphite of Lime—Quinine—Digitalis—Food and Stimulants—Hot and Cold Sponging—Zinc Oxide—Gallic and Tannic Acids—Sulphuric Acid—Alum—Plumbic Acetate—Cupric Sulphate—Perchloride of Iron with Strychnine—Dover's Powder—Belladonna—Atropine—Picrotoxine—Agaricine—Pilocarpine—Sulphonal—Camphoric Acid—Tellurate of Sodium—Hydrastis Canadensis, etc., etc. *Treatment of Cough*—Forms of Cough—Need for Caution in the Use of Opiates—Alkaline Drinks to Promote Expectoration—Inhalations, balsamic and sedative—Counter-irritation—Sedative Syrups, etc., etc. *Treatment of Vomiting*—Explanation of its Causation—Management with regard to Food, etc. *Treatment of Hæmoptysis*—Tendency to spontaneous Arrest—Different Forms—General Management—Ergot and Ergotine—Gallic Acid—Hamamelis—Turpentine—Sulphuric Acid with Aperient Sulphates—Perchloride of Iron—Digitalis—Acetate of Lead—Common Salt—Ipecacuanha—Local Application of Cold—Opium and Morphine—Aperients—Blood-letting—Blistering—Cupping—Alcohol—Prophylactic Measures. *Treatment of Disorders of Digestion*—Loss of Appetite—Dyspepsia—Pyrosis—Constipation—Gastralgia—Diarrhœa. Additional Formulæ.

Having passed in review the various remedies and methods of treatment that have been directed to the *general* condition of the phthisical patient, regarded more or less apart from any particular symptom, we shall next consider the best method of dealing with individual symptoms, as they occur, in the often very protracted course of this malady.

One of the most efficient means we possess for relieving the *symptoms dependent on the pulmonary congestion and inflammation*, which so constantly accompany the process of tuberculisation, is **counter-irritation.** It is often attended by manifest relief of cough, diminution of fever, and marked improvement in the local physical signs.

The best mode of counter-irritation is the repeated application of flying blisters. Two or three small blisters, about the size of a penny-piece, are placed over the area of dulness, or the affected portion of lung; they are applied in succession over different but contiguous spots, and retained from two to four or five hours, according to the delicacy of the skin; redness of the skin rather than vesication being aimed at, so that the blistering may be frequently renewed over the same spots. In this way a small blister may be moved, from spot to spot, over, for instance, the supra- and infra-clavicular regions in front, and over the supraspinous and interscapular regions behind. When the whole of the desired surface has been blistered, a few days' rest may be allowed until the skin is again in a condition to bear a renewal of the counter-irritation. Subsequently the counter-irritation may be kept up by the application of iodine. For this purpose it is best to use a mixture of equal quantities of the *tinctura* and *linimentum iodi* of the B. P. The former is too weak and the latter too strong to be used separately. It is advisable to avoid painting each day the *same* spot; it is best to choose one spot one day, another the next, and so on, so as to be able to maintain this treatment.

A very favourite method of applying counter-irritation in France is the rapid application of the actual cautery, in the form of a white-hot pointed cone of metal; that invented by Paquelin, and called Paquelin's cautery, is usually employed. By its means a number of small pointed cauterisations can be rapidly made and frequently renewed. It has the advantage of being clean, rapid, and almost painless. It is usual to make about twenty to thirty of these cauterisations, under one or both clavicles, every five days. We greatly prefer these methods to croton oil liniments, or tartarised antimony ointment.

Fever is one of the most important symptoms we are called upon to treat in the progress of a case of phthisis, as it is certain to be present in some part, if not in the whole of its course. So long as the fever remains uncontrolled, we know that the "*consumption*"—*i.e.* the exhaustion of the patient's strength, and the wasting of his substance—must go on. Indeed, we rightly test most of our remedies for phthisis by the thermometer. All those remedies which have been described under the head of "general" remedies, when they succeed in influencing favourably the progress of the disease, have the effect of lowering the febrile temperature. In so far as the fever may be dependent on congestion or inflammation of the surrounding lung tissues, counter-irritation in relieving or modifying these conditions will also have the effect of lowering the temperature.

But, besides these general and local remedies, there are others which have been especially used on account of their influence, more or less direct, over the febrile process.

Quinine and *digitalis*, together or singly, have been largely used as antipyretics in phthisis. We have ourselves employed them very extensively in the treatment of phthisis, and have often found them of real value. One drawback to their use, however, is that in certain patients they produce some irritation of the gastro-intestinal mucous membrane; this is more frequently the case when digitalis is given in the form of powder.

Niemeyer speaks very favourably of the combination of quinine and digitalis in the fever of phthisis, especially when it assumes a somewhat periodic form, with marked evening exacerbations ushered in by chills.

Jaccoud and Sée trust to quinine, and give it in large doses.

The advantage of using quinine as an antipyretic, in comparison with other proposed remedies, is that it acts as a general tonic, and while it checks the fever, it also, in small doses, improves the appetite.

There is rarely any necessity for the large doses given by Sée and Jaccoud; we have found the following combination improve appetite, increase strength, and keep down the fever and night sweats:

℞ Quininæ hydrochloratis	2 grains.
Calcis hypophosphitis	4 ,,
Tinct. nucis vomicæ	15 minims.
Tinct. aurantii	30 ,,
Glycerini	1 dram.
Aquæ	ad 1 oz.

To be taken half an hour before meals three times a day.

Another remedy for the fever of phthisis which has found many advocates is *salicylic acid* or *sodium salicylate.* Jaccoud considers salicylic acid preferable to quinine in the treatment of the hectic fever of the advanced excavation stage, on account of its antiseptic properties; the fever in this stage being due, as we may assume, in great measure, to the absorption of septic substances into the circulation from the seat of the destructive processes going on in the lung. He prefers salicylic acid to sodium salicylate, as he considers the former more antiseptic, and that, therefore, its antipyretic action lasts longer; he only employs the soda salt when the acid causes gastric disorder. The insolubility of salicylic acid in water occasions a little difficulty in its administration. It may be given in wafers, about 7 grains every half hour, until the full dose, 14 to 28 grains, has been taken, and it should be given about four hours before the febrile exacerbation sets in.

Bartholow* points out that ten parts of salicylic acid can be dissolved in 100 parts of water by the addition of 8 parts of borax. The following formula, therefore, may be used: Borax 80 grains, hot water 8 ounces, dissolve, add salicylic acid 100 grains, then filter and add tincture of orange-peel and simple syrup, each 1 ounce. This will make a 10-ounce mixture, each tablespoonful of which will contain 5 grains of salicylic acid. One tablespoonful, with three or four of weak brandy and water, can be given every hour, until the requisite dose has been taken.

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* "Materia Medica and Therapeutics," p. 335.

If sodium salicylate is used instead of salicylic acid, it must be given in the same way, but in somewhat larger doses, 10 to 20 grains at a time.

Antipyrin has been largely used to reduce the temperature in febrile forms of phthisis. One of the strongest advocates of its use is Dr. Daremberg, of Mentone; but his testimony is greatly at variance with that of other most careful observers. Nervous depression, vomiting, occasional profuse sweatings, great lowering of cardiac power, are effects of its use that have been recorded by many different physicians; whereas Dr. Daremberg is reported * to say that it never causes sickness or loss of appetite, even in 90-grain (!) doses daily, and that sweating was lessened.

We, as well as many other physicians, handle this drug with more caution, and we consider it better adapted to the reduction of temporary rises of temperature than to more prolonged ones. A dose of from 5 to 20 grains, according to the tolerance of the patient, is given three or four hours before the expected rise of temperature, and if its action is found to be purely temporary, and if it is attended with much depression of the circulation, much sweating, vomiting, or nervous depression, some other remedy should be chosen.

As an adjunct to our means of controlling rises of temperature in phthisis, antipyrin is certainly of value, but we must watch carefully its effect both on the patient and on the temperature.

Phenacetin in small doses—2 or 3 grains—in combination with hydrobromate of quinine—2 to 4 grains—three times a day, we have found useful in reducing temperature in phthisis, without causing any appreciable depression, and we greatly prefer it to antipyrin.

Closely connected with the fever of phthisis are the **nocturnal perspirations.**

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* *British Medical Journal,* June 13, 1885.

These may be arrested or diminished by a variety of means. The appropriateness of the remedy will depend on whether the nocturnal perspiration is the termination of a crisis of hectic fever, or whether it is simply the result of exhaustion, or a consequence of a special condition of the skin common in phthisical patients. Those who regard these perspirations as exclusively symptomatic of fever should bear in mind that in certain persons profuse perspirations are produced by causes quite independent of fever, and associated apparently with a peculiar affection of the skin; that it is not an uncommon symptom during convalescence from many acute exhausting diseases, as well as in all states of general debility. Moreover, sleep itself appears to have some direct influence in the production of these perspirations in some cases, as they will often occur during the daytime if a phthisical patient falls asleep. Then again, the sweatings at night are often associated with violent fits of coughing, and would seem to be induced by them, the muscular efforts associated with protracted fits of coughing in these debilitated subjects giving rise to profuse perspiration.

If, therefore, we are careful to bear in mind that the nocturnal perspirations of phthisis may depend either on the hectic fever, or on a peculiar condition of the skin, or on simple debility, or finally on the exhausting effects of severe paroxysms of cough, or on a combination of two or more of these factors, we shall be able to understand how it happens that different remedies succeed in checking these perspirations in different patients.

When, as in many cases, the sweatings are found to come on regularly at a certain fixed hour of the night, generally from 2 to 4 a.m., it is pretty safe to regard them as connected with the daily febrile paroxysms. If, however, the patient states that *whenever* he wakes up from sleep at any time, day or night, he finds himself bathed in perspiration, it must be looked upon as dependent on exhaustion or associated with a peculiar condition of skin. Remedies, therefore, directed to the improvement of the general constitutional state, to the relief of the exhaustion, and the promotion of nutrition, will often prove more effectual than any other means in arresting these perspirations. We have repeatedly noticed—and Prof. Charteris, of Glasgow, has borne testimony to the same effect—that the administration of the hypophosphite of lime in the manner already directed leads to the cessation of the nocturnal perspirations in from ten days to three weeks; and this may be regarded as a test of the suitability of the remedy. If, after the use of the hypophosphite for three or four weeks, we find it has no influence over the night sweats, we usually set it aside as of little or no value in that particular case.

When the evening temperature is high (the rise of temperature frequently commences early in the afternoon), from 102° to 103·5°, and the night sweats appear to be undoubtedly febrile, quinine or a combination of quinine and digitalis prove valuable remedies. The quinine, however, should not be given near bed-time, as it often provokes sleeplessness, and aggravates the night cough, and digitalis, if given for long periods at a time, is very apt to cause gastric disturbance. Another drawback to the use of quinine is that it very frequently excites headache in phthisical patients. It is, however, a valuable remedy in treating the pyrexia, and the associated night sweats, in a large number of cases of phthisis.

The two following are useful forms for the administration of quinine and digitalis:

℞ Quininæ hydrochloratis	3 grains.
Acid. hydrochlor. dil.	5 minims.
Tincturæ digitalis	10 ,,
Tincturæ chloroformi compositæ ...	5 ,,
Aquæ cinnamomi	ad 1 oz.

To be taken twice a day (about 12 and 6), an hour before meals.

℞ Quininæ sulphatis	3 grains.
Pulv. digitalis	$\frac{1}{2}$ grain.
Extracti lupuli	q.s.

F. pil. To be taken twice a day at the same hours.

To patients who do not bear quinine well, arsenic may be given: arsenious acid $\frac{1}{50}$ grain, or arseniate of iron $\frac{1}{12}$ of a grain in a pill, three times a day may be given. When the perspirations appear to depend upon exhaustion, light food with some alcohol taken at bed-time, or about 2 or 3 a.m., will often greatly diminish this tendency, such as a breakfast-cupful of arrowroot or beef-tea, or milk, with a tablespoonful of brandy or whisky.

Druitt recommended sponging the body with water as hot as can be borne. We have often proved the efficacy of sponging the whole body, or only the chest and back, at bed-time with cold water to which a little vinegar and eau-de-Cologne have been added; or a lotion may be prescribed as follows:

℞ Spr. vini rectif.	āā 2 oz.
Acidi acetici dil.	
Aquæ flor. aurantii	12 oz.

M. f. lotio.

This may be further cooled when used by the addition of a little ice.

Professor Peter also speaks highly of this plan.

Of the various *astringent* remedies that have been recommended for the relief of the night sweats of phthisis, none is so deservedly popular as *zinc oxide.* It may be given by itself, in the form of pills, in 5- or 10-grain doses at bed-time; or it may be advantageously combined with extract of henbane, which appears to promote its action.

Gallic and tannic acids, in doses of from 3 to 10 grains, are reliable remedies, and useful often when other means fail, but as they not infrequently lead to troublesome constipation, it is as well to keep them as a resource in obstinate cases.

The aromatic sulphuric acid in 15- or 20-minim doses, in an ounce of cinnamon water, at bed-time, is a useful remedy in slight cases; and in more troublesome ones a combination of this remedy with gallic acid will be found useful. Alum with sulphuric acid and with opium, acetate of lead and opium, sulphate of copper and opium, have all been recommended.

In very chronic cases the perchloride of iron in 15- to 20-minim doses three times a day is valuable for its astringent as well as its general tonic effect, and the addition of 3 to 5 minims of liquor strychninæ increases its usefulness. The dilute phosphoric acid has also had its advocates. It should be given in 15- or 20-minim doses three times a day.

When the nocturnal perspiration is produced by paroxysms of coughing, medicines which allay the cough and procure sleep will alleviate the sweating. It is probably in this way that Dover's powder exercises a beneficial influence over the night sweats in many cases. It may be given (without the sulphate of potash) in the form of a pill, containing a grain of opium and a grain of ipecacuanha, at bed-time. It will constantly arrest the night sweats during its administration, but they return immediately it is omitted; and it has this serious drawback, that owing to the specific action of the opium in diminishing the secretion of the bronchial mucous membrane, thick tenacious mucus accumulates in the air-tubes during the night, in some cases, and gives rise to much coughing during the early part of the day to expel it.

The influence of *belladonna*, that is, *atropine*, in diminishing the cutaneous secretion is well known. It is certainly, in many cases, a very effectual remedy for this symptom; but in other cases it fails to produce any decided effect, unless it be given in doses sufficiently large to produce most unpleasant results. Many patients strongly object to it, even in moderate doses, owing to the dryness of the throat and unpleasant taste in the mouth, and disturbances of vision, which it frequently causes. In not a few cases it also sets up gastro-intestinal irritation. Nevertheless, with all these drawbacks, it is a most valuable resource in the treatment of the nocturnal perspirations of phthisis. It may be given subcutaneously in the form of atropine injections, from $\frac{1}{200}$ to $\frac{1}{60}$ of a grain. The succus belladonnæ also answers well in doses of from 10 to 30 minims. The tincture and the extract may also be employed.

Of other remedies that have been suggested for the night sweats of phthisis, the following may be mentioned: *Picrotoxine*, in doses of $\frac{1}{180}$ to $\frac{1}{60}$ of a grain: *Agaricus*, the powdered "white agaric," in 5- to 15-grain doses : a most popular remedy in France, and commended by Trousseau, Peter, and many others : *Agaricine*, $\frac{1}{12}$ grain in pill has been also highly extolled : *Pilocarpine*, recommended by Ringer in doses of $\frac{1}{20}$ grain, three times a day : *Nitrate of muscarine* acts similarly : *Sulphonal*, in 8- to 16-grain doses, has been found efficacious in the relief of this symptom : *Camphoric acid* has been strongly recommended for the relief of night sweats, 15 to 60 grains in wafers, the stomach being empty, if possible ; it is believed to act by destroying the ptomaines produced by the bacilli : *Tellurate of sodium* is another modern remedy for this symptom, $\frac{1}{4}$ to $\frac{3}{4}$ of a grain for a dose ; it is considered to act in the same way as the preceding ; it has the drawback of imparting an odour of garlic to the breath : *Hydrastis canadensis*, 30 minims of the fluid extract, has also been found of value.

It has also been suggested that the entire body should be powdered with a powder composed of three parts of salicylic acid, ten parts of starch, and eighty-seven parts of talc, the patient's mouth and nose being covered with a handkerchief. If the skin is very dry, the powder may be made to adhere by first rubbing the surface with fat bacon. Painting the trunk (after first drying the surface) with a very strong solution of gum arabic has been suggested as an effectual remedy. This dries in a few minutes, and next morning the skin is washed with tepid water, which causes a considerable reduction of temperature.

A bladder filled with ice, and placed on the surface of the abdomen for some hours, has been found of use. Sponging the body with a weak solution of belladonna, or with a solution of chloral (2 drams to 8 ounces of spirit and water) has been advocated as a successful expedient.

Nothing is of greater importance in the management of a case of phthisis than the proper treatment of the **cough**, especially when this symptom takes, as it frequently does, a prominent place in the sufferings of the patient. Pidoux, who had an exceptional experience in the treatment of phthisis, says:* "It is impossible to possess too many means for repressing a symptom which so exasperates the disease." But in treating the cough of phthisis it is necessary to be discriminating. In the first place, we must constantly bear in mind the relation of cough to expectoration, and we must keep in view the fact that the cough of phthisis may be either

(1) Simply a cough of expectoration: *i.e.* a cough with an object, that object being to rid the air-passages of secretions which have accumulated in them, and which offer an impediment to respiration; or it may be

(2) Purely a cough of irritation, a *dry* cough, which is not accompanied or followed by expectoration; or it may be

(3) Both a cough of expectoration and a cough of irritation; and this last is the kind of cough we, in nine cases out of ten, have to deal with in phthisis.

We should especially guard against the error of treating the cough of phthisis as purely a cough of irritation, to be overcome solely by the use of sedatives, such as opium, etc.

We do not undervalue the usefulness of opium, morphine, and codeia in the treatment of phthisis; for there are few cases of this disease which will not need, in some part of their course, the cautious use of opium or its derivatives. It has been said "without opium the treatment of phthisis would be impossible." But by bearing in mind the relation of cough to expectoration, we shall best be guided to its correct management. So long as the cough is always attended with expectoration we must be very careful in the use of opium, for opium, by diminishing bronchial secretion, causes an inspissation of the mucus in the air-passages, and makes it more tenacious and more difficult of expulsion. If a considerable dose of opium has been given overnight the patient on waking in the morning is often harassed with fearful paroxysms of coughing; coughing which has for its object the expulsion of the tenacious, inspissated mucus that has accumulated in the air-passages during the profound opium sleep.

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* "Etudes Générales et Pratiques sur la Phtisie," p. 428. Second edition.

The morning cough of phthisical patients is almost invariably a cough of expectoration, for in most cases of phthisis there is a tendency to tracheal and bronchial catarrh, and during the hours of sleep the catarrhal secretion accumulates, and on waking has to be expelled. To endeavour to allay this morning cough by giving opiates is commonly to do harm, for the expectoration is hindered or put off to become more difficult when the temporary anæsthesia of the bronchial mucous membrane, which opium induces, has passed away; moreover, when opium is given at this morning hour, appetite and digestion are injuriously affected for the whole day.

The best mode of dealing with this morning cough is to promote the expectoration of accumulated secretion by giving warm alkaline drinks to which a little alcohol may be added. It is the property of warm alkaline solutions to promote expectoration, possibly by their solvent action on mucus, and the tenacious mucus accumulated during the hours of sleep is rendered more fluid and easy of expulsion. Equal parts of warm milk and Ems or Apollinaris or Bourboule water, to which one or two teaspoonfuls of brandy or whisky or rum have been added, form an excellent drink for the purpose. Or, if more convenient, a dose or two of a mixture containing 10 grains of sodium bicarbonate, and 3 grains of common salt, with 20 minims of spirit of chloroform in each dose, may be given with a little hot water or hot milk and water, until the matters to be expectorated have, to a great measure, been got rid of.

If the morning cough is treated in this way, the paroxysms, as a rule, are soon over, and a long period of comparative freedom from cough is commonly ensured.

In association with warm alkaline drinks the inhalation of some stimulating balsamic vapour for a few minutes, together with the steam of hot water, will promote the object in view, and make it more complete, and secure a prolonged period of immunity from cough. The oleum pini sylvestris, or sanitas oil, or terebene, or tincture of benzoin, are all useful in this way.

But, on the other hand, there are many cases, especially of advanced phthisis, in which, after the discharge of much expectoration, an irritable condition of the mucous membrane of the air-passages remains, and a cough of expectoration is succeeded by a cough of irritation, and it may be necessary to inhale a few drops of chloroform, or to give some sedative syrup to relieve this; and we should have the less hesitation in prescribing this when we know we have already contributed to the clearing away of accumulated secretion in the air-passages.

Cough of this kind is often relieved by inhaling from an oro-nasal respirator a few drops of a mixture of chloroform, or spirit of chloroform and carbolic acid. So also, in some cases of phthisis, and especially in early stages, and when some dry pleurisy is found over one or other apex, or when early inter-laryngeal changes have shown themselves, we may have to deal with a cough which is often purely irritative, and unattended by any expectoration; this kind of cough is peculiarly distressing to the patient, because it is without aim or object, and sometimes with little or no intermission. It is often exceedingly troublesome and fatiguing during the night, preventing sleep, and inducing feverishness, and profuse, exhausting perspirations. We must spare no effort to relieve this form of cough.

When there is evidence of the existence of dry apical pleurisy, and the signs must be especially looked for in the supraspinous fossæ, counter-irritation will often prove a valuable remedy. It may be applied in the form of strong iodine paint, or better, as small flying blisters, moved about from one spot to another over the apex, in front and behind, and repeated from time to time.

But in treating this form of cough we must be prepared for the necessity of frequently changing or modifying our remedies. Butyl chloral is a useful remedy, and may be given in 2- to 5-grain doses made into a syrup, with a little glycerine, syrup of tolu, and camphor water. Chloral hydrate and bromide of potassium, together or separately, have been found to relieve this form of cough. These remedies find their appropriate use in the case of phthisical patients of neurotic or hysterical temperament. They should be given at bed-time in 5- to 15-grain doses—the chloral acts best when combined with potassium or sodium bromide. It is advisable to reserve this remedy for occasional use, and give some other in the interval. Given about every third night, it proves frequently a valuable help in advanced cases.

We have found belladonna of great service in relieving the cough of phthisis, and the following form is a good one:

℞ Succi belladonnæ...	āā 60 minims.
Spr. chloroformi	
Mucilaginis et syrupi	ad $1\frac{1}{2}$ oz.

M. Take one or two teaspoonfuls for a dose.

This remedy, given at night, has the further advantage of checking the tendency to night sweats. It is useful in all forms of phthisical cough, but most so in those cases in which there is both excessive secretion, which it diminishes, and excessive irritation, which it allays. Opium and belladonna combined often act better than either separately; they correct one another. A pill containing $\frac{1}{3}$ to 1 grain of extract of opium, with $\frac{1}{3}$ to $\frac{1}{2}$ grain of extract of belladonna may be given at bed-time.

Codeia is a most useful sedative, as it does not disturb the functions of the stomach and liver, as preparations of opium and morphine often do, and it calms the cough in most cases. When it fails to do so we have to fall back on morphine. The dose of codeia is from $\frac{1}{3}$ of a grain to a grain. The following is a convenient form, and may be called syrup of codeia:—Codeia 2 grains, distilled water and syrup of orange flowers each 1 ounce; one or two teaspoonfuls occasionally.

The following combination of cherry-laurel water, aconite, and opium will often relieve the cough better than opium alone.

℞ Extracti opii liquidi	80 minims.
Tinct. aconiti	36 ,,
Aquæ laurocerasi	120 ,,
Syrupi	ad $1\frac{1}{2}$ oz.

M. f. syrup. One teaspoonful for a dose.

A simple means of calming the cough of laryngeal irritation, is sipping iced water; but it is often necessary in such cases to apply a solution of nitrate of silver (10 grains to the ounce) to the epiglottis and glottis. When the cough is due to irritation or hypersensitiveness of the pharynx, as it sometimes is, combined with laryngeal irritability, the pharynx and larynx being both the seat of an irritative catarrh, a good plan is first to wash away the catarrhal secretion by a warm borax gargle, and then brush the mucous membrane of the pharynx and larynx with the following solution:

℞ Cocainæ hydrochloratis	10 grains.
Morphinæ hydrochloratis	1 grain.
Glycerini	2 drams.
Aquæ camphoræ	ad 1 oz.

M. f. sol.

In severe cases the patient may also be allowed to sip very slowly half a teaspoonful of this solution occasionally. The morphine and ipecacuanha lozenges of the B. P. are very convenient for the slighter attacks of cough with throat irritability. In most cases of advanced phthisis we shall be compelled to have recourse, at times, to the preparations of opium or morphine to allay the cough.

"In advanced phthisis," says the late Dr. Thaon, of Nice, "the results obtained from morphine are so constant and so striking that I do not hesitate to formulate the following proposition: viz. *where in a case of phthisis we have exhausted the whole materia medica, we have still a resource left in morphine.*"

The following formulæ for cough syrups will be found useful:

℞ Morphinæ acetatis liquor	āā 2 drams.
Aquæ laurocerasi	
Syrupi limonis	4 drams.
Mucilaginis acaciæ	ad 1½ oz.

M. f. syrup. Dose, a teaspoonful.

℞ Acid. hydrocyanici diluti	āā 36 minims.
Tincturæ belladonnæ	
Extracti opii liquidi	64 minims.
Syrupi limonis	4 drams.
Mucilaginis acaciæ	ad 1½ oz.

M. f. syrup. Dose, a teaspoonful.

Other sedatives, recommended by different practitioners for the relief of the cough of phthisis, are—*Oxalate of cerium* in 2- to 3-grain doses in pill (useful also in arresting vomiting); *cannabis indica*, ¼ to 1 grain of the extract in pill, or 5 to 20 minims of the tincture made into a mixture with mucilage; *prunus virginica* (wild cherry), the syrup in dram doses and the tincture in 20- to 60-minim doses;

thirty to sixty minims of the tincture of *hyoscyamus*, alone or combined with bromide of potassium. *Tincture of gelsemium* in 15-minim doses has been found effectual when other remedies have failed. This list is far from exhausting the number of suggested remedies.

When an asthmatic tendency or predisposition is associated with phthisis, opium cigarettes, or stramonium cigarettes, the cigarettes de Joy or d'Espic, will be found, perhaps, the best remedies for the night cough.

Oertel * recommends inhalations of the sprays of the following solutions in the irritative cough of phthisis:—a 4 per cent. solution of aqua lauro-cerasi; a 0·2 to 0·4 per cent. solution of aqueous extract of opium; an emulsion of olive oil made by mixing one to five parts of oil with one to two parts of gum arabic and 100 parts of water; and Wilson Fox recommends sprays of cocaine (5 to 10 per cent.), of morphine (2 grains to the ounce), and atropine ($\frac{1}{8}$ or $\frac{1}{6}$ grain to the ounce), and the inhalation of the vapour of conium. To the value of antiseptic inhalations, especially when containing chloroform, in relieving cough and diminishing expectoration we have already testified.

In all cases in which the cough is associated with profuse expectoration from chronic catarrh of the air-passages we should endeavour to diminish the amount of this secretion; for this purpose inhalations of creasote, of tar, of oleum pini sylvestris, of terebene, of spirits of turpentine are useful, and so especially is rubbing the chest night and morning with the turpentine liniment of the British Pharmacopœia.

Peter recommends pills containing $\frac{1}{6}$ of a grain of extract of opium and $\frac{1}{12}$ of a grain of extract of belladonna, one or two occasionally; these allay irritation as well as check secretion. He also gives a mixture of syrup of tolu and syrup of turpentine to diminish the profuse catarrh.

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* "Respiratory Therapeutics."

Vomiting after taking food is a very troublesome incident which most patients with chronic phthisis complain more or less of. Soon after taking a meal, or even during it, an attack of cough comes on, the paroxysms increasing in severity until a considerable quantity of mucus is brought up, and with it the contents of the stomach. The nature of this cough has been to some extent misunderstood. It has been referred to irritation of the gastric portion of the vagus by the contact of food,* and as due to a state of special irritability of the gastric mucous membrane, and therefore the remedy is to give a rapidly absorbable sedative just before taking food, such as a few drops of laudanum in a teaspoonful of water, and immediately after the meal three drops of hydrochloric acid in water.

Another view of the cause of this incident assumes that it occurs chiefly in the more indurative forms and stages of this disease, and that it is due "to the mechanical difficulty in expelling secretions from cavities and bronchial tubes, which are surrounded by dense, tough, airless consolidations" (*Powell*). Both these explanations, partially true as they may be, leave out of sight a very simple and obvious contributory cause. It must be remembered that, with these patients, the air-passages are in a catarrhal state, and pour out secretion profusely on any excitement. Now even in cases of simple laryngeal catarrh, as most persons have experienced, upon taking a meal, although the cough may have been absent for some time, the secretion of mucus is augmented, and coughing recommences. It is clear that on taking food and drink there is a direct stimulus given to the circulation, and by rapid absorption of fluid from the surface of the stomach the quantity of fluid in the blood-vessels is rapidly increased. This soon leads to increased secretion in the catarrhally affected air-passages, and this fresh secretion, added to what had already accumulated before food, causes a blocking up of the air-passages, and so leads to repeated and long-continued efforts of coughing to get rid of the accumulation, and at last in the final violent contractions of the diaphragm and abdominal muscles, the contents of the stomach are expelled, mixed, as we have again and again seen, with great quantities of bronchial mucus. It is also a noticeable feature that the vomiting in these cases is rarely preceded or accompanied by any nausea; it seems purely mechanical. Indeed, when vomiting after food is associated with nausea we regard this fact as indicating the existence of a morbid condition of the gastric mucous membrane, and treat the case accordingly.

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* Peter, "Leçons de Cliniques Médicales," vol. i. p. 524.

Acting upon these considerations we are in the habit of treating those patients who complain of severe paroxysms of cough, with vomiting, after or during meals, in the following manner:—Our object is to promote free expectoration, and so clear the air-passages immediately before the ingestion of food, and thereby postpone the cough after food, until the stomach has had time to digest the chief part of its contents. In order to do this the patient is ordered a small quantity of warm, stimulating drink about half an hour before a meal, and is directed to encourage rather than suppress cough, so as to get up as much expectoration as possible before he sits down to his food. A tumblerful of equal parts of hot milk and seltzer or Ems water with a tablespoonful of brandy or whisky answers well, and will usually cause a good deal of expectoration. If milk is objected to a cupful of beef-tea or chicken-broth with a tablespoonful of brandy may be taken instead. A few deep inhalations of some stimulating vapour such as that of pinol, terebene, or sanitas oil obtained by pouring a few drops on the surface of boiling water will greatly aid the object in view, namely, the expulsion of all the secretion possible *before* the meal is begun. Then let the meal consist of as little fluid as possible, and give a few grains of pepsin with a few drops of hydrochloric acid, in water, immediately after it.

If, however, we have reason to believe that gastric irritability is a factor in the process, then we can try Peter's remedy, or give some preparation of bismuth with three or four drops of dilute hydrocyanic acid, a short time before a meal. In other cases benefit sometimes results from giving 5 minims of liquor strychninæ an hour before food.

Next as to the treatment of **hæmoptysis.**

It is not easy to estimate accurately the precise value of any particular remedy that has been used for the relief of this symptom. There are attacks of hæmoptysis which are almost immediately and of necessity fatal, as for instance many of those in the later stages of phthisis, dependent on the sudden rupture of an aneurismal dilatation of a branch of the pulmonary artery of considerable size coursing along the walls, or stretching across a large vomica. No medicine can be relied upon to stop bleeding of this kind. On the other hand, there are attacks of hæmoptysis, for the most part congestive, occurring at long intervals, and limited perhaps to a single, more or less considerable gush of blood, followed by expectoration of blood for a short time, *i.e.* as long as extravasated blood remains in the air-passages; these require chiefly precautionary treatment to avoid recurrence. But even more protracted attacks tend, in favourable circumstances, to cease of themselves; it is not easy, therefore, when they do cease, to estimate with accuracy the precise share our treatment has had in producing this result.

It is also by no means a rare occurrence to observe a decided improvement in the physical signs, and a notable arrest of the progress of the tubercular infiltration after a more or less copious hæmorrhage.

"Nothing," says Pidoux,* "is so certain to cease of itself, after a given time, as hæmoptysis, provided we do no more than protect the patient from all injurious influences;" and of the febrile forms, he

* "Études Générales et Pratiques sur la Phtisie." Second edition.

adds: "they follow their course, and end without being influenced, notably, by the most energetic remedies." "There are certainly cases in which a certain amount of hæmoptysis is more useful than injurious; it produces a notable diminution in the rapidity of progress of the tuberculisation." It is not, therefore, advisable in *all* cases, and especially in the congestive febrile forms, to be in a hurry to arrest the bleeding. But in every case it is of the greatest importance to give the patient and his friends confidence as to the result being favourable. Remember that there is rarely any immediate danger, and that when there is our art is often of little avail. Always, however, do something! There is nothing that calms and allays anxiety in the minds of patients and their friends so much, in these alarming circumstances, as being given *something to do.* We should remember how much the capillary circulation is under the influence of the emotions in some subjects, and therefore that a suitable mental impression may have a distinct physical effect on the peripheral vessels, and so aid in suppressing hæmorrhage.

In the reports which patients bring us of loss of blood from the lungs we must be prepared for much exaggeration.

Active treatment is not required in slight cases; we should see that the bowels are regulated by a mild aloetic pill, that the food is cold, light, and simple, and active exercise for a time should be forbidden. If blood-stained expectoration continues, and if the mucus is thick and tenacious, and expelled with difficulty, we should prescribe 3 or 4 ounces of Ems water twice a day; if it is thin and abundant, we should order 10 to 20 minims of dilute sulphuric acid, with $\frac{1}{12}$ of a grain of morphia in a little syrup and water twice or three times a day.

A large sudden gush of blood from the lungs may usually be regarded as due to the ulcerative erosion of a vessel of some size before it has had time to become obliterated, and this form may be encountered comparatively early in the course of rapidly progressing disease; while in advanced cavity cases it may be referred to the rupture of an aneurismal dilatation of a branch of the pulmonary artery in the wall of a cavity: but serious hæmorrhages, and perhaps more protracted ones, will arise from congestion of the bronchial mucous membrane, or the lung substance itself in the vicinity of advancing tubercular deposition, and those capillary hæmorrhages due to local hyperæmia are, probably, the most readily amenable to treatment.

Protracted, or more or less continuous slow hæmoptysis, is not infrequently encountered when phthisis attacks the lungs of debilitated or dissipated persons whose lungs are, perhaps, already the seat of degenerative emphysema. This form of hæmoptysis is, so far as our own experience has extended, exceedingly difficult to arrest.

There are certain general rules which apply to the treatment of *all* cases of hæmoptysis. These are to keep the patient perfectly quiet in bed in the semi-recumbent position, to forbid all conversation and all mental excitement; to keep the apartment cool and airy, to allow only cold light food and cold iced drinks, and to let the patient suck fragments of ice. We do not regard the sucking of ice as likely to have an important influence over bleeding from the lungs, nor is it absolutely necessary, as some appear to think, that the patient should always have a lump of ice in the mouth. We regard it chiefly as a convenient way of allaying feverish thirst without adding much fluid to the blood. Iced whey, made with alum, is an appropriate drink.

Of the various remedies advocated for the treatment of hæmoptysis, we will first refer to the use of *ergot*, *ergotine*, and *ergotinine.*

There is an overwhelming weight of testimony in favour of the efficiency of these remedies in cases of erious and copious hæmoptysis. To be useful, they must be given frequently, and in full doses; if by the stomach, a dram of the liquid extract may be given every half hour or every hour for eight to twelve doses, according to the severity of the case, and then less frequently.

Bonjean's ergotine, a purified watery extract of ergot, is a popular form for its administration.

Hertz * gives the following as a good formula for hypodermic injection: Bonjean's ergotine 40 grains, alcohol, glycerine, each 2 drams—dose 6 to 18 minims.

Or the ergotine may be dissolved in distilled water, and if required to be kept, a little carbolic acid added to it. To avoid irritation and inflammation it is best to inject it deeply into the substance of the gluteal muscle.

A more elegant preparation, especially for hypodermic use, is the *ergotinine of Tanret.* This can be obtained in a clear white solution, which produces no irritation or inflammation of the connective tissue as ergotine often does—the dose for injection is 3 to 10 minims.

It is in copious and continued hæmorrhage (probably from a number of capillaries) that ergot and its preparations are chiefly of value. In the sudden profuse hæmoptysis of advanced cavity cases due to aneurismal rupture it is not so suitable a remedy. We should remember that the object of treatment in such cases is to favour the formation of a plug or coagulum at the seat of rupture.

Gallic acid is a valuable remedy for controlling and arresting pulmonary hæmorrhage; it is especially useful in lingering small hæmorrhages, and in apyretic forms. It must be remembered that it is very insoluble in water, and that it should be given dissolved in glycerine or rectified spirit. The following is a good formula for its administration:

℞ Acid. gallic.	... 80 grains.
Glycerini	... 4 drams.
Spr. vini rectif.	... ad 2 oz.

M. f. sol. Two teaspoonfuls in a tablespoonful of iced water every hour or two, then less frequently.

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* Article on "Hæmorrhage of the Lungs," Ziemssen's "Cyclopædia of Practical Medicine."

Hamamelis tincture, in 20-minim doses every hour or two, has been found serviceable in slight cases.

Turpentine is undoubtedly a valuable remedy in troublesome forms of pulmonary hæmorrhage. It may be given in capsules, each containing 5 minims, every half hour until six doses have been taken ; or it may be given, in from 5- to 20-minim doses, made into an emulsion with mucilage, or yolk of egg and syrup, three or four times a day. In very grave cases, due apparently to aneurismal rupture within a cavity, Dr. Williamson, of Ventnor, has given as much as 30 minims every half hour for three doses, followed by a dose of castor oil ; and he thinks it the best remedy in such cases.

Sulphuric acid in the less severe and less urgent attacks, or after the arrest of such by ergotine, is an excellent remedy, and it is well, when there is no counter-indication, to combine it with sulphate of magnesia, and if there is some feverishness, as there often is, some quinine—as in the following prescription :

℞ Acid. sulphurici aromatici	15 minims.
Magnesii sulphatis	1 dram.
Quininæ sulphatis	1 grain.
Aquæ	ad 1 oz.

M. f. haust. To be taken every three or four hours.

Perchloride of iron is a useful remedy in some cases, especially in apyretic anæmic forms. It should be given in 10- to 20-minim doses, with a little syrup and water, every two or three hours. It is maintained by Dujardin-Beaumetz that its usefulness depends not on any astringent property it may have, but on its power of moderating cardiac action, and in reducing the number of beats of an irritable feeble heart.

Digitalis.—Some divergence of opinion exists as to the propriety of administering digitalis in hæmoptysis. Jaccoud insists that it should be discarded entirely from the treatment of phthisical hæmoptysis, because it "augments the contractility of the heart, and the vascular tension." But Jaccoud in this, as well as in many other matters, is far too dogmatic and theoretical. There are forms of hæmoptysis in which it is conceivable that digitalis might be injurious; and if we had any evidence that phthisical hæmoptysis was frequently due to increased cardiac tone, and augmented vascular tension, digitalis would certainly be an unsuitable medicine. But we have no such evidence. The weight of authority is, moreover, decidedly in favour of the use of digitalis in certain forms of hæmoptysis. Ringer recommends the infusion in large doses. "When it quiets the pulse," he says, "the bleeding ceases." Hertz advises its use when the action of the heart is very excited. Pidoux counsels digitalis in large doses in the febrile forms of hæmoptysis. Fonssagrives also considers digitalis a good remedy when fever accompanies the hæmorrhage. Bartholow says it is especially useful when there is "frequent expectoration of bloody mucus, with occasionally a mouthful of florid blood, accompanied by fever. This group of symptoms is dependent on transudation from a number of small vessels about the site of a pneumonia due to a tubercular or caseous deposition."

It may therefore be accepted that digitalis is a valuable addition to other remedies when we desire to regulate and quiet excited action of the heart in cases of hæmoptysis.

Acetate of lead was, at one time, largely employed as a remedy for hæmoptysis, but it is less frequently used now. Its action is too slow for urgent cases, and its constipating effect makes it an inappropriate remedy in the more chronic forms of slow continued bleeding. It may be tried in the latter class of cases when other remedies fail. The best mode of administering it is in solution in distilled water with a little dilute acetic acid—1 to 3 grains for a dose, with 5 to 20 minims of dilute acetic acid.

Common salt is an old remedy for hæmoptysis and salt and water used often to be given by the nurses of the Brompton Hospital as an extemporary measure. Hertz considers it an efficacious expedient given in doses of a half or a whole tablespoonful, either dry or mixed with a little water, and he quotes Skoda's explanation of its action, viz. "as an irritant upon the gastric mucous membrane, producing through the sensory nerves of the stomach a reflex action upon the small pulmonary arteries, whereby the latter are contracted." Niemeyer also recommends that the patient should be made to swallow one or two teaspoonfuls of finely-powdered dry salt.

Ipecacuanha in nauseating and emetic doses has been strongly advocated in the treatment of hæmoptysis by Trousseau, Peter, and other French physicians. In England it has never been a popular remedy, and it must always be an unpleasant one. Having weighed the evidence for and against this mode of treatment, we are in agreement with Hertz,* that "the danger that new hæmorrhages may be produced by the jarring of the body during the act of vomiting, is so apparent that this mode of treatment should meet with disapprobation in spite of the high standing of its advocates."

Cold, applied locally, is no doubt a powerful agent in arresting some forms of hæmorrhage. Cold wet compresses may be applied to the chest, cooled by placing them on ice; in persons very sensitive to cold a piece of ice may be enclosed in a thin pocket-handkerchief and rapidly passed over the chest; or, as Niemeyer advises, frozen compresses may be applied. These are prepared by filling "a tin or copper warming-pan with ice, salt and water, and then laying it upon a well-squeezed wet compress, the moisture of which freezes." They are preferable to heavy bladders of ice. In the profuse, sudden and alarming attacks of hæmoptysis, in advanced cavity cases, this is one of our best resources.

The *inhalation of pulverised styptic solutions* to arrest hæmorrhage from the lungs, has been warmly advocated by Oertel and others, but we consider this method only of use in certain exceptional cases, and we must refer to Oertel's work for a full account of it.*

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* Ziemssen's "Cyclopædia of Practical Medicine," vol. v. p. 319.

The use of *opium* or morphine, or codeia, in combination with whatever other remedy may be employed, is indicated in all cases of serious hæmoptysis. There exists some difference of opinion on this point we know, but the testimony of most writers of authority and experience is in favour of this view. Not only is it urgently necessary in most cases to quiet the cough, for every effort at coughing alarms the patient, as it is attended with fresh hæmorrhage, but the calming influence on the nervous system which opium and morphine exert is also of great value. Niemeyer says: "Narcotics should be employed freely. The more restless the patient, the more violent the cough, so much the more boldly should we give opium." Hertz testifies to the same effect. Dujardin-Beaumetz † says: "You must add calmatives to all your other remedies, especially morphine, to quiet the fatiguing and painful cough which accompanies the hæmoptysis." G. Sée also urges the importance of combining opium or morphine with ergotine or other remedies. He always injects $\frac{1}{6}$ of a grain of morphine hypodermically after the injection of ergotine. He considers it indispensable. Jaccoud is most emphatic on the necessity of giving opium; he is in the habit, in certain obstinate forms of hæmoptysis, of prescribing $\frac{1}{3}$ of a grain of the extract every hour until somnolence is produced, and he keeps up the influence of the drug by means of diminished doses for three whole days after the cessation of the hæmorrhage.

The hæmoptysis of the *intemperate* who become the subjects of phthisis is often associated with a certain amount of venous congestion, and it is necessary in these cases to give *purgatives.* A combination of 1 dram of sulphate of magnesia with 15 minims of dilute sulphuric acid in an ounce of infusion of roses every three or four hours, and if necessary 1½ grain of extract of aloes in a pill, once a day, until we establish a free fluid discharge from the bowels, is the best treatment for such cases, which, however, generally do badly.

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* Ziemssen's "Handbook of General Therapeutics," vol. iii. Smith and Elder, London.

† "Leçons de Clinique Thérapeutique."

When we have reason to believe that the pulmonary affection is connected with syphilis we must combine iodide of potassium with our other remedies.

Blood-letting will rarely be an appropriate remedy in the hæmoptysis of phthisis, of whatever use it may be in other forms of pulmonary hæmorrhage, as for example in the passive hyperæmia, with tendency to stasis of blood in the lungs from heart disease; and in those rare cases in robust persons which have been attributed to sudden intense pulmonary hyperæmia.

Extensive and repeated blistering of the chest (Jaccoud), and the application of numerous dry cupping-glasses to the base of the chest (Jaccoud, Pidoux, and others), and to the lower extremities are more popular with the French than with English or German physicians. It is impossible to apply blisters and cold compresses at the same time; and the application of blisters should be reserved to those cases of obstinate continued bleeding dependent on congestive or inflammatory hyperæmia.

The application of dry cupping-glasses to the base of the chest we have seen useful in relieving the congestion of the lung, which seems, in some cases, to be excited by the effusion of blood, rather than its cause, and patients themselves are inclined to regard the proceeding with favour, as an active measure which they can, in a certain way, comprehend.

We must never overlook the value of aperients as derivatives in suitable cases. The alkaline sulphates are the best.

With regard to the use of alcohol some differences of opinion are encountered. G. Sée strongly advocates it. He says:* "Alcohol in large doses is a most energetic hæmostatic; in obstetric practice this property of alcohol is daily utilised, in pulmonary hæmorrhages its use is scarcely mentioned, and yet it merits being taken into serious consideration, not only because it supports the patient's strength, but because it acts on the vascular system."

This is a measure which must be largely left to the wisdom and discretion of the medical attendant. Small quantities of iced brandy-and-water are certainly useful in some cases, and seem to have a good effect in steadying the action of the heart, in lessening the effect of nervous shock, and in preventing fatal syncope after large losses of blood.

There are, finally, certain *prophylactic* measures which should be enforced on persons who are phthisical, and who belong to the hæmorrhagic diathesis. It is well known how readily and from what slight causes such persons bleed. They should, therefore, avoid all exciting and fatiguing games and exercises; they should not take out-of-door walking exercise when there is a cold north or east wind blowing. They should avoid hot, exciting food, and such drinks as tea, coffee, wine, and spirits, except in very small quantities. It is, however, good for them to live much in the open air of the country in fine weather. Mountain air is certainly not counter-indicated, but residence too close to the sea is often prejudicial.

It is scarcely necessary we should allude to the proposed induction of pneumothorax as a remedy for hæmoptysis. As the walls of a cavity (from which the bleeding may be supposed to proceed) are often firmly adherent to the chest walls, or connected with lung substance which is adherent, the effect of the operation on the bleeding must, necessarily, be very uncertain, while it itself introduces a grave complication.

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* "De la Phtisie Bacillaire."

Disorders of digestion.—Disturbances of digestion accompany some cases of phthisis from beginning to end, more or less gastric catarrh being almost invariably present. The constant recurrence of these gastric troubles is always of ill omen, and the phthisical patient who eats and digests well is already on the way to amendment.

(1) Simple *loss of appetite* is one of the most common of these troubles. It is often best remedied by change of air, by removing the patient from a close, confined town residence to the pure air of the country, where exercise in the open air can be freely taken.

Where it depends on feeble tone of the stomach, this may often be roused and improved by vegetable bitters combined with small doses of sodium bicarbonate, which act as a stimulant to gastric secretion when given a short time before food. The best of the vegetable bitters are: calumba, chirata, gentian, quassia, bitter orange-peel, quinine, and, perhaps, best of all, strychnine and nux vomica. Fifteen to twenty minims of the tincture of nux vomica, with 5 grains of sodium bicarbonate and 20 minims of spirit of chloroform in an ounce of infusion of calumba, taken an hour before meals, will often promote appetite.

When there appears to be no indication for alkalies we sometimes succeed better in promoting appetite by giving 3 to 5 minims of liquor strychninæ, combined with 15 minims of dilute hydrochloric or phosphoric acid in an ounce of infusion of orange-peel two hours before meals.

(2) Loss of appetite is in many cases associated with genuine *dyspepsia*, due either to the presence of gastric catarrh, or to atony of the gastric functions, defective gastric secretion, etc. This catarrhal condition is often evidenced by retching in the morning, and the bringing up of stringy stomachal mucus, or quantities of a thin watery fluid (pyrosis).

Bismuth is one of the most efficacious remedies we possess for these catarrhal dyspepsias, and when there is a tendency to vomiting from irritability of the gastric mucous membrane, a small dose of opium may be combined with it. The following is a good formula—it should be taken almost directly before food :

℞ Bismuthi subnitratis	10 grains.
Tinct. opii	2 minims.
Magnesii carbonatis	5 grains.
Misturæ tragacanthæ	2 drams.
Infusi aurantii	ad 1 oz.

M. f. dosis.

When there is much flatulent distension of the stomach and intestines during digestion very great benefit will often follow the administration of 1 minim of creasote mixed with a little glycerine and peppermint water immediately after a meal. While the alkalies prove so beneficial in some of those cases, when given *before* food, a dose of hydrochloric acid is often found of the greatest service, taken immediately *after* a meal. This is especially the case in the feeble atonic forms of dyspepsia, when there is clearly an insufficient or imperfect secretion of gastric juice; in such cases 10 to 15 minims of dilute hydrochloric acid in a little glycerine and water, with or without 4 or 5 grains of pepsine directly after food, will prove of great use.

(3) The *constipation* which attends some of those cases is best treated by an aloetic pill—1 to 2 grains of the watery extract of aloes, with $\frac{1}{2}$ a grain of extract of nux vomica, and $\frac{1}{2}$ a grain of powdered ipecacuanha ; this pill should be taken at night, and the next morning it should be followed by a large teaspoonful of Carlsbad salts in half a tumblerful of hot water.

(4) The attacks of *gastralgia*, with obstinate vomiting, which occasionally occur in phthisical patients must be treated according to the rules laid down in a former chapter.

The occurrence of **diarrhœa** in the course of a case of phthisis will always excite the suspicion that it may be due to tuberculous ulceration of the intestine. But we may have to deal with a diarrhœa from simple intestinal catarrh, or with one due to those digestive difficulties so commonly encountered in phthisical patients. The results of treatment will enlighten us on this point, and, as a rule, the presence of severe localised continued abdominal pain will point to the existence of tubercular ulceration. Something also may often be learnt from the examination of the stools, and we should be careful to see whether portions of hard irritating scybalæ are mixed with the loose motions, or whether they contain mucus, or mucus mixed with blood.

The occasional diarrhœa due to intestinal catarrh, or to the irritation of retained fæces, and the sequel of constipation, will be best treated by gentle aperients, at first; perhaps the best is a small dose (a teaspoonful) of castor oil the first thing in the morning, with two tablespoonfuls of hot milk, and a teaspoonful of brandy. This dose may be repeated if necessary. If some catarrhal diarrhœa still remains it will usually yield rapidly to a few doses of bismuth subnitrate (10 grains), with sodium bicarbonate (5 grains), and compound kino powder (5 grains). Soft unirritating farinaceous foods should at the same time be prescribed.

If the diarrhœa is associated with a great deal of flatulent distension, and the passage per anum of fœtid gases, 1 minim of creasote shaken up with a tablespoonful of lime water, should be given immediately before each meal, or 5 or 6 grains of salicylate of bismuth may be given instead.

Amongst other remedies for the diarrhœa of the phthisical, not dependent on intestinal ulceration, perhaps none is more generally useful than *lime water*, given in ounce doses, with an equal quantity of milk several times a day; or we may use the *liquor calcis saccharatus* in doses of 30 to 60 minims. *Tannate of* *bismuth*, which has been greatly praised, is given in doses of 10 to 30 grains in the day.

In cases where there is much pain accompanying the diarrhœa, whether it is due to intestinal ulceration or not, we shall have to employ opium in some form, and it is undoubtedly better to give it by the rectum than by the stomach ; a small enema consisting of 5 or 10 grains of Dover's powder (or 5 to 10 minims of laudanum), and 5 or 10 grains of tannin mixed with 2 ounces of starch mucilage, and injected into the rectum twice a day, will be found a very efficacious remedy ; or we may use the suppositories of acetate of lead and opium (P.B.), but these are slower in their action ; or a hot flannel sprinkled with laudanum may be placed over the abdomen.

The diarrhœa attending advanced tubercular ulceration is notoriously difficult of arrest ; besides the means suggested above, pills containing nitrate of silver ¼ to ½ grain and opium ½ grain, given three times a day, we have found of great service when other remedies have failed. Sulphate of copper given in the same way has been found useful. In advanced cases we have found the *extract of coto bark* very efficacious.

We give it in the following form :

℞ Fluid extract of coto, 60 minims.
Compound tincture of cardamoms, 60 minims.
Mix these together and triturate them slowly with mucilage of acacia, 3 drams, and simple syrup, 2 drams.
Finally add water to 6 oz.

A tablespoonful of this mixture is a dose.

In this form it is an opaque mixture, with a not unpleasantly warm and aromatic taste. We have usually found two or three doses of this mixture arrest or check severe forms of phthisical diarrhœa.*

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* The chapter on the *Treatment of Diarrhœa* may be consulted for other remedies.

ADDITIONAL FORMULÆ.

For the pyrexia of phthisis.

℞ Quininæ hydrochlor., 15 grains.
Sodii salicyl., 30 grains.
Sodii bicarbon., 45 grains.

M. et divide in pulv. 10. A powder twice or thrice a day. (*Schnitzler.*)

For the fever of phthisis.

℞ Quininæ sulph., 24 grains.
Pulv. digitalis, 12 grains.
Pulv. ipecac., 6 grains.
Pulv. opii, 6 grains.
Extr. glycyrrhizæ, q.s.

Ut f. pil. 24. One three times a day. (*Heim.*)

For sub-febrile states in phthisis.

℞ Potassii bicarb., 6 drams.
Liquor. morph.-hydroch., 1 dram.
Aquæ laurocerasi, 2 drams.
Aquæ destill. ad 8 oz.

M. f. mist. A large tablespoonful with as much fresh lemon juice every four hours whilst effervescing. (*Whitla.*)

For hæmoptysis.

℞ Ergotini, 30 grains.
Morphinæ hydroch., 1½ grain.

M. et divide in pil. 10. One three times a day. (*Schnitzler.*)

For the same.

℞ Spirit. terebinthinæ, 1½ dram.
Ol. amygdalæ dulc., 1½ dram.
Mucilag. acaciæ, 5 drams.
Syrupi simp., 5 drams.
M. et adde
Aquæ ad 8 oz.

Ft. emulsio. A tablespoonful every half hour. (*Bamberger.*)

For the night sweats.

℞ Salicylic. acid., 2½ drams.
Venetian talc, 6 oz.
Starch powder, 6 oz.
Iris powder, 5 drams.

M. f. pulv. To be applied to the surface. (*Bamberger.*)

For the same.

℞ Agaricini, 1½ grain.
Pulv. ipecac. co., 20 grains.
Pulv. althææ, q.s.
Mucilag. acaciæ, q.s.

Ut f. pil. 20. One or two at night. (*Bamberger.*)

For the same.

℞ Zinci oxidi, 3½ grains.
Extr. belladonnæ, ⅛ grain.
Extr. hyoscyami, 2½ grains.

M. f. pil. At bed-time. (*Whitla.*)

For diarrhœa of phthisis.

℞ Extracti opii, 1½ grain.
Syrup. aurantii, 5 drams.
Infusi calumbæ ad 5 oz.

M. f. mist. A tablespoonful every two hours.

Or

℞ Bismuthi subnit., 30 grains.
Extr. opii aquosi, 3 grains.

M. et divide in pil. 10. One every two or three hours. (*Schnitzler.*)

CHAPTER IV.

THE TREATMENT OF COMPLICATIONS OF PHTHISIS AND THE SURGICAL TREATMENT OF PHTHISICAL CAVITIES.

Treatment of Laryngeal Phthisis—Inhalations—Solvent—Disinfecting—Astringent—Emollient—Applications of Iodine and Carbolic Acid—Sodium Benzoate Spray—Boric Acid and Tar Water—Balsams of Peru and Tolu—Nitrate of Silver and Alum, Tannin, etc.—Iodoform and Morphine—Cocaine—Creasote and Chloroform—Menthol—Lactic Acid. *Treatment of Pleuritis*—Anodyne Liniments—Blisters—Iodine—Paquelin's Cautery—Strapping the Chest—*Treatment of Effusions—Pneumothorax and Pyopneumothorax*—Opium and Stimulants—Dry-cupping—Introduction of Capillary Trocar—Indications and Counter-indications for Operation—*Fistula in ano—Acute Tuberculosis—The Surgical Treatment of Phthisical Cavities.*

The only complications of phthisis, the treatment of which it is necessary to consider here in detail are the following:

1. Affections of the larynx and laryngeal tuberculosis; 2. Pleuritis; 3. Pneumothorax and pyopneumothorax; 4. Fistula in ano; 5. Acute tuberculosis.

The last may be either a complication of phthisis—*i.e.* a general infection occurring in the course of pulmonary phthisis; or it may be the original malady; in either case its treatment may conveniently be considered in this place.

Laryngeal phthisis.—The distressing laryngeal affections which frequently occur in the course of phthisis may assume various degrees of severity, from simple catarrhal conditions to necrosis and exfoliation of cartilages and diffusion of tuberculous deposit through the mucous and submucous tissues; morbid conditions in which we are compelled to have recourse mainly to topical treatment.

In the catarrhal conditions, when *acute* or *subacute*, and when the laryngeal mucous membrane is injected, swollen, dry, and painful, Oertel recommends the inhalation of cold air ;* but when it is covered with copious secretion from the bronchi and lungs, we should employ free irrigation by means of sprays of cold water, or of solvent and disinfecting solutions—such as Ems water, solutions of sal ammoniac, or common salt or borax (1 to 5 per cent.). When symptoms of irritation have subsided we should substitute inhalations of a solution of tannin (1 to 2 per cent.) and carbolic acid (1 per cent.) If there is much secretion from the laryngeal mucous membrane itself we may employ inhalations of the solutions of other astringents, such as acetate of lead (1 to 3 per cent.), or nitrate of lead (1 to 3 per cent.), or alum (¼ to 2 per cent.), or sulphate of zinc (1 to 4 per cent.). But we must not be in haste to employ astringent remedies, and they are to be especially withheld so long as there is any sensation of dryness or constriction in the larynx. When the larynx is very irritable, and even inhalations of Ems water, or weak solutions of common salt cannot be borne, we must have recourse to emollient vapours and fluids such as the steam or spray of hot water, or of hot infusions of marsh mallow or of elder-flowers, to any of which a little glycerine may be added, or a little ipecacuanha wine together with a few drops of laudanum.

In more *chronic* catarrhal conditions, with considerable swelling of the laryngeal mucous membrane, which may be either dry and irritable, or covered with excessive secretion, we shall rarely be able to do more than palliate symptoms.

Dr. J. Solis Cohen† recommends that the tumefied portions of the mucous membrane should be well painted every two or three days with equal parts of the compound solution of iodine and glycerine, or with a weak solution of iodine and carbolic acid, and the parts kept as free as possible from secretion by the use of an alkaline solvent inhalation. He employs the following formula:—5 grains of borax, 1 dram of glycerine, and 7 drams of tar water.

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* "Respiratory Therapeutics," p. 299.

† "Tuberculosis of the Larynx." *Journal of the American Medical Association*, Sept. 8, 1883.

When **ulceration** occurs the treatment becomes still more onerous. "The utmost care is required, as in the treatment of other obstinate ulcers, to keep the ulcerated surface clean, and to ward off injurious influences which may irritate the parts adjacent to the ulcers, and hasten the disintegrating process. . . . The bronchial and cavernous secretions already in different stages of decomposition, when coughed up, adhere to the asperities on the surface of the ulcer, and suffer further decomposition. As in the treatment of open wounds and ulcers generally, keeping them clean is the first condition for the healing process" (*Oertel*). For this purpose the inhalation of large quantities of a disinfecting solution like that of sodium benzoate is very useful, which, "inhaled by the patient, and partially expectorated again, effect so rapid and thorough a cleansing of the ulcers as cannot easily be obtained by any other method." The same purpose may be answered by the inhalation four or five times a day, for fifteen to twenty minutes at a time, of a 2 to 3 per cent. solution of carbolic acid. Or a solution of boric or salicylic acid in tar water may be used for the same purpose.

The vapours of the balsams of Peru or tolu are often serviceable. These balsams are mixed with half their weight of alcohol and twelve to twenty drops poured on hot water, and the mixed vapours inhaled.

"When a thorough cleansing and disinfection of the base of the ulcer has thus been effected, or when healthy granulations appear in some places, their development may be encouraged and strengthened by the occasional application of nitrate of silver, either carefully introduced by the brush, or by inhalations of 0·1 to 0·3 per cent. solutions two to four times a day for ten to twelve minutes at a time. It is not till the ulcers approach cicatrisation, and present abundant granulations, while there is an absence of disturbing pathological changes, such as œdema of the different parts, especially over the cartilages, that astringent agents may be ventured upon, to effect a complete retrogression of the inflammatory processes, and the development of a permanent cicatricial tissue. For this purpose inhalations of astringents combined with disinfectants are admirably adapted, such as alum or tannin with carbolic acid, or nitrate of silver alone, in 0·3 to 0·5 per cent. solutions or stronger, chloride of iron, nitrate of lead, or sulphate of zinc in moderately strong solutions, two or three applications daily of ten to fifteen minutes each." *

When painful inflammatory symptoms accompany the ulcerations, and when, owing to the situation of the ulcers, they are exposed to mechanical irritation during swallowing, we encounter a most distressing condition, and one often extremely difficult to alleviate.

The insufflation of iodoform and morphine in powder† is one of the best remedies for this state, but as J. Solis Cohen has pointed out, it is important that the ulcerated surface should first be thoroughly cleansed by an alkaline spray so that the powder may reach the diseased surface, and not be simply entangled in the secretions covering it. He also mentions the expedient, in the earlier stages of dysphagia, of swallowing a teaspoonful of sweet oil immediately before taking food, which coats the parts with a protective covering, and lessens friction.

We have another valuable resource in the application to the parts exposed to irritation of a 10 per cent. *solution of cocaine*, or the spray of a 2 to 4 per cent. solution of cocaine may be applied to the larynx shortly before taking food. In very severe cases we may accompany the local application of cocaine with the hypodermic injection of $\frac{1}{6}$ to $\frac{1}{3}$ of a grain of morphine, and in most of those cases it will be advantageous to administer some part at least of the food in a peptonised form by the bowel.

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* Oertel, p. 802.

† Semon's formula is iodoform; boric acid, each 1 gr.; morphine, $\frac{1}{8}$ gr.

In the worst cases, Oertel says he has "obtained most good from the application by means of a brush of a concentrated solution of nitrate of silver (2 to 3 per cent.).

"The compound formed by the salt of silver with the albuminates of the ulcerated surface coats over the denuded nerves, which are, at least for the next twelve or twenty-four hours, thus protected from the direct influence of the oxygen of the atmosphere, as well as from mechanical injury.

"Where direct manual application is impossible for one reason or another, weaker solutions than the above may be brought into contact with the ulcerated surface by inhalation."

When there is much dyspnœa from obstruction of the glottis through tuberculous infiltration, thickening of the mucous membrane, and accumulation of viscid mucus, this may sometimes be relieved by inhalations of cold air, or the spray of iced water, or the expectoration of this viscid mucus may be promoted by the inhalation of solvent alkaline sprays.

When the larynx is filled with offensive sputum, clinging to the jagged ulcerated surface, disinfecting as well as alkaline solvent inhalations are necessary.

A solution of sodium bicarbonate, 10 grains, common salt, 5 grains, glycerine of carbolic acid, 1 dram, and water, 1 ounce, may be employed, or the solution of sodium benzoate already mentioned.

The wearing of such an inhalation respirator, made of perforated zinc, as we have already described, charged with terebene, creasote, carbolic acid, or eucalyptol, will, as Dr. Solis Cohen observes, be useful "for antiseptic, astringent, and slightly stimulating purposes;" and when an equal quantity of chloroform is mixed with either of these substances, a few drops inhaled from the sponge of the respirator will often relieve the harassing cough of this painful affection better than any other remedy; or ethyl iodide may be used in the same way.

We must not withhold from the patient who is suffering otherwise irremediable distress, in an advanced stage of this afflicting malady, the temporary comfort of a hypodermic injection of morphine, or the inhalation of thirty or forty drops of chloroform.

For the *aphthous* condition of the mouth and throat often met with in these cases, a boric acid lotion to which a few drops of tincture of myrrh are added, is the best remedy.

Menthol has been found very useful in some of these cases. It is mixed with sweet almond oil (1 in 5), and applied by means of a sponge or an endo-laryngeal syringe.

The application of agents for destroying the tubercular deposit has been advocated where practicable; of these, *lactic acid* is the best.

The general treatment of the patient will be conducted on the principles already laid down; a tonic and supporting regimen being as far as possible adopted, and an open-air life followed when practicable.

Pleuritis.—Some inflammatory affection of the pleura is almost certain to be encountered during some period of the progress of a case of phthisis. These are usually attacks of dry pleurisy, and they are often attended with a good deal of *pain* aggravated by breathing, coughing, etc. Apart, however, from these attacks of pleuritis phthisical patients occasionally appear to suffer a good deal from what seem to be *painful affections* of the *intercostal nerves and muscles*; these latter painful conditions of the chest wall are best relieved by friction with a liniment composed of equal parts of the belladonna and chloroform liniments of the B. P.; or a belladonna or opium plaster will relieve the more strictly circumscribed pains

The pleuritic affections of the upper part of the chest, where they are most frequently encountered, are generally relieved by counter-irritation, especially in the form of flying blisters, or iodine paint frequently re-applied, or the application of Paquelin's cautery. When these attacks occur at the base of the chest, it is as well to fix the side of the chest affected as immovably as possible for a time, by means of strips of adhesive plaster 4 or 5 inches wide and extending from 2 or 3 inches beyond the spine behind to the same distance beyond the median line in front. By this means the patient will be spared much of the distressing pain attending cough and inspiration, and by the enforced rest of the part affected the risk of extension of the inflammation will be lessened, or if there is risk of perforation of the pleura pulmonalis from the softening of some superficial deposit, this risk also will be diminished by this measure. If the pressure of strapping cannot be borne, relief of the pain may often be obtained by the application of a hot flannel sprinkled with laudanum.

Now and then in the course of a case of phthisis we encounter a large fluid effusion into one or other pleural cavity; how should such a complication be treated? At first, at any rate, the patient should be confined to his bed, and his diet carefully regulated, his bowels kept open, and if there is any considerable amount of fever some quinine (2 to 3 grains) should be given him in an effervescing saline draught every five or six hours. Should the fluid, whether serous or purulent, be removed by aspiration? We are strongly of opinion that it should not, unless its amount is so considerable that grave dyspnœa is caused by it. It will often be observed, in one-sided phthisis, if a considerable pleuritic effusion occurs, so as to compress the lung completely on that side, the progress of the disease in the lung is by that means arrested, and remains quiescent so long as the lung remains compressed by the effused fluid; but if a too zealous physician removes the fluid by aspiration the disease in the lung will usually be found to progress rapidly after the operation.

It is, therefore, in our opinion the best practice to leave pleuritic effusions in phthisical patients alone, unless urgent dyspnœa, or other adequate motive, necessitate their removal.

Pneumothorax and pyopneumothorax.—The pain, dyspnœa, and shock, which attend sudden perforation of the lung, and the development of pneumothorax in the subjects of phthisis, are best treated by the administration of stimulants and opium. A tablespoonful of brandy, with a little water, or a dose of ammonia and ether mixture every hour for a few hours, and to the latter five to ten drops of tincture of opium may be added; or if the pain and dyspnœa are very severe, a hypodermic injection of $\frac{1}{6}$ of a grain of morphine may be immediately given and repeated after an hour, if necessary.

It is scarcely ever necessary in cases of phthisis to resort to blood-letting in order to relieve the sudden hyperæmia of the uncompressed lung; this may be needed in some traumatic cases, but in most patients with phthisis who become the subjects of this complication, there has been for some time slow wasting of blood, and therefore excessive hyperæmia of the unaffected lung is little to be feared. Free dry-cupping over the sound side is, however, a desirable expedient for relieving the engorgement of that lung.

The patient should be kept perfectly quiet, and not allowed to talk; the diet should consist of light, easily digested food, and an effervescing dose of citrate of potash and ammonia, to which a grain or two of quinine may be added, should be given occasionally to check the tendency to febrile reaction.

A regular action of the bowels should be secured by means of enemata if necessary, or an aloes and soap pill may be given daily. By preventing constipation, which opium, if given, is likely to produce, we avoid a further cause of dyspnœa from the upward pressure of the retained intestinal contents on the diaphragm.

When there arise evidences of considerable pressure within the thorax, such as increasing dyspnœa, and great displacement of the heart and surrounding organs, the tension of the air within the pleura must be relieved by the introduction of a capillary trocar, an operation which is perfectly harmless, and often attended by great relief of immediate distress. It is obvious that the expedient will fail to give relief unless the perforation of the lung is closed, and it is impossible to ascertain this beforehand; usually, however, when the opening is small it closes in three or four days.

Fraentzel * recommends that the trocar should be introduced between the fourth and fifth ribs somewhat external to the mammary line. If necessary it may be retained in the chest, its opening being covered by a piece of gold-beater's skin. When it is withdrawn the small wound made should be closed with a strip of adhesive plaster, or covered with collodion, and some apply a small ice-bladder to the seat of the puncture for twenty-four hours.

If violent cough should come on (as it sometimes does) during the withdrawal of air from the pleural cavity, it must be quieted by hypodermic injection of morphine, or the trocar may be removed, and the opening compressed for a time until the irritative cough has disappeared. If this precaution be disregarded it has occasionally happened that distressing general emphysema has been suddenly induced from the air violently expelled, during cough, from the pleural cavity, entering the subcutaneous areolar tissue around the punctured opening.

Before long *suppurative pleuritis* follows the pulmonary perforation, and the pneumothorax is converted into a *pyopneumothorax.* We must be very careful, here, as in the case of serous effusion, how we interfere for the purpose of removing it.

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* "Diseases of Pleura," Ziemssen's "Cyclopædia of Practical Medicine," vol. iv. p. 770.

When the other lung has been sound it has, occasionally, been observed that the occurrence of pneumothorax and consequent empyema has, by compressing the diseased lung, arrested the progress of the disease in it, and patients have been observed to live for many years with pyopneumothorax. In such cases purulent absorption is avoided by the pleural cavity becoming lined with a thick pyogenic membrane, and so suppurative fever is prevented; whereas, these patients often sink rapidly after free opening of the pleural cavity has been made to give exit to the accumulated pus. Operative interference for the removal of the effusion is only warranted when this is of such an amount that it gives rise to serious dyspnœa and dangerous displacement of the heart and surrounding organs. Moreover, if paracentesis be attempted soon after the accident, the perforation in the lung may not be firmly closed, and may be reopened.

If there are much pain and fever excited by the secondary pleurisy, linseed poultices sprinkled with laudanum may be applied locally, moderate doses of quinine should be given in an effervescing saline draught, and hypodermic injections of morphine, or opium by the mouth, will be required to relieve the pain and distress of the patient. Later on, should there be evidence of decomposition of the effusion, with symptoms of infective fever, operation may be needed.

Fistula in ano.—The only question that has to be considered with regard to the treatment of fistula in ano when it occurs as a complication of phthisis, is whether or not it should be operated upon. Surgeons certainly are averse from performing this operation in cases of undoubted phthisis. It has been suggested as a reason, not against operation, but against *curing* the fistula, that it acts as a useful derivative to the pulmonary lesions, and some have observed, or fancied they have observed, a kind of alternation in the activity of the fistula, and the pulmonary affection.

We are disposed to regard this as more fancied than real, and to believe that if the fistula could be cured, without other risk than this, it would be altogether a gain to the patient, and save him much inconvenience and pain, and remove a cause of debility and exhaustion. But what would chiefly influence our opinion would be the general constitutional condition of the patient and the stage of his pulmonary disease, because the feverish and debilitated state, in which the majority of phthisical patients are found, would interfere greatly with the success of the operation, and prevent healthy cicatrisation, and this would be an all-sufficient reason for objecting to surgical interference. But if the pulmonary affection is quiescent, and the patient is otherwise in sound health, and leading a healthful life, and of average vigour, and is himself anxious to be relieved of the annoyance, we should not ourselves be disposed to offer any opposition to the operation. Another valid objection to the operation would be the possible tuberculisation of the tissues around the fistula which would present an obstacle to healthy healing, and this possibility ought to be duly considered.

Acute tuberculosis.—The possibility of cure, and the propriety of active treatment of cases of acute tuberculosis and acute phthisis, have been maintained by Professor McCall Anderson, by Lebert, and by Jaccoud. The two latter maintain that they have seen anatomical proof of such cures, *post-mortem*, in persons who have afterwards died of other disease.

Jaccoud maintains that he has had under his care one case, and that the only case he has ever seen, of cured acute tuberculosis. He gives the clinical history of the case in the work we have already often mentioned.* He further states that he has seen three cases of acute tuberculosis which, instead of terminating fatally, have merged into cases of chronic phthisis. Meningitis, he states, was absent in all those cases.

His plan of treatment is to endeavour to subdue the fever with bromohydrate of quinine and with salicylic acid. The latter he appears to think may have some antiseptic action; also he has the body sponged several times a day with aromatic vinegar mixed with cold water. To relieve the dyspnœa, and to modify the local lesions, he repeatedly applies large blisters to different parts of the chest, especially over the regions where physical signs of morbid changes are found; he also has dry cupping-glasses applied to the lower limbs and trunk, morning and evening, from forty to sixty (!) at a time. When symptoms of peritoneal mischief of a certain intensity appear, such as pain, tympanites, and partial or complete immobility of the diaphragm, he applies ice continuously to the abdominal surface.

To support the strength of the patient he gives wine and alcohol in quantities proportionate to the age, constitution, and habits of the patient, and to the amount of febrile exhaustion; broths, jellies, milk, and peptonised foods of various kinds are also given. He expresses a belief that more cures of acute tuberculosis would be recorded were it not for the "inertia" and "discouragements" of the physician.

Dr. McCall Anderson also believes † "that acute phthisis may be recovered from in a considerable proportion of cases."

His method of treatment rests on the two indications "to keep up the strength, and bring down the fever." For this purpose "the patient should be fed on fluid food every hour, or even every half hour, day and night; stimulants are required early in the attack, and may often be taken with advantage, even to the extent of ½ an ounce every hour." In the fever a pill of quinine (1 grain), digitalis (½ grain), and opium (¼ grain) is given every four hours, or "large doses of quinine—from 10 to 30 grains—given once in twelve to forty-eight hours, and, if possible, at the time when the temperature commences to rise." He also applies cold to the surface in some form, and prefers Leiter's temperature regulators applied to the surface of the abdomen. The patient is to suck ice freely, and the food and drinks are to be iced, the body is sponged with iced vinegar and water, and even iced enemata are sometimes used. "A considerable experience," he says, "points to the conclusion that, if we are to bring our patients labouring under acute phthisis to the harbour of convalescence, it is by attacking them at the earliest possible moment—but it must be done *with energy and with confidence as to the issue*, else it will be imperfectly done."

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* "Curabilité et Traitment de la Phtisie Pulmonaire," p. 289.

† "Treatment of Pulmonary Consumption," an address by Dr. McCall Anderson, Professor of Clinical Medicine in the University of Glasgow.

Ruehle * doubts if recovery is possible from acute tuberculosis. "In the two cases of recovery which I have seen," he says, "I prefer to suppose a blunder in diagnosis was committed."

Peter appears to share the opinion of Ruehle.

For our own part we have not had the good fortune to see such recoveries as those recorded by Jaccoud and McCall Anderson, but we should be most reluctant to say that they are impossible.

[Since writing the above we have seen a case with Dr. Ferris, of Uxbridge, which *appeared* to be one of acute pulmonary tuberculosis affecting both lungs, which made a good recovery, *to our great surprise !*]

The surgical treatment of phthisical cavities.—It must be admitted that the attempt to deal with phthisical cavities by surgical drainage, and the expedient of intrapulmonary injections of anti-parasitic substances into the pulmonary tissues, have neither of them been attended hitherto with very satisfactory results.

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* Article on "Acute Miliary Tuberculosis," Ziemssen's "Cyclopædia of Practical Medicine," vol. v.

It is doubtful if ordinary phthisical cavities will ever admit of successful surgical interference, either by drainage, incision, or aspiration. It is exceedingly rare in phthisis to find a single cavity without adjacent lesions, and most commonly there is extensive surrounding pulmonary disorganisation, so that whatever alleviation of particular symptoms (profuse or fœtid expectoration, for example) might occur, it could only be temporary. Then it is not always easy to ascertain the precise situation of a cavity, unless it is quite superficial; and again, we ought always to be able to satisfy ourselves that there is complete adhesion between the costal and pulmonary pleura, or we may contribute to the production of pneumothorax. It is also most undesirable to attempt to drain a cavity through any great depth of pulmonary tissue, especially when this is in a diseased condition, and it is difficult to realise that any good could result from the drainage of such a cavity, if it communicates freely with a bronchus.

We are in a position to state that very sudden fatal results have followed surgical interference with phthisical cavities, even in most skilful hands, but these fatal results occurring in private practice escape publication.

Basic bronchiectatic cavities, or cavities resulting from hydatids, may offer reasonable hope of satisfactory results from surgical operation, but we can quite confirm the belief expressed by Dr. Clifford Allbutt, "that ordinary phthisical cavities will lend themselves to systematic aspiration or other tapping is not at present probable, and we must seek the cure by antiseptic and aseptic atmospheres."

CHAPTER V.

REGIMINAL TREATMENT OF PHTHISIS.

Importance of Hygienic Treatment—Food—In Relation to the Fever—Value of Fats and Carbohydrates—Care in the Preparation of Food—Milk and Cream—Koumiss—Kéfir—Raw Meat—Farinaceous Foods—Alcohol—*Suralimentation*—Diet should be varied and attractive—Daily Dictary—Air and Ventilation—Value of Open-air Treatment—Pneumatic Treatment—Effects of Inspiration of Compressed Air and Expiration into Rarefied Air—Bodily Exercise—Lung Ventilation—Hydrotherapy—Baths and Douches—Sponging—Clothing—Summary.

We propose in this chapter to consider the regiminal or hygienic treatment of phthisis, the importance of which cannot be over-estimated. A disease which so profoundly affects the nutrition of the body must be encountered by the most scrupulous regard of all those daily and hourly conditions and habits of life which tend to support and strengthen the constitution, and impart to it a resisting power.

A very great part of the undoubted advantage which phthisical patients gain from residence in such sanatoria as those of Göbersdorf and Falkenstein, may be fairly attributed to the constant detailed and intelligent supervision they receive in these institutions.

"*Im Kleinen grosse*"—"Great in small things"—is the motto chosen by Dr. Dettweiler, of Falkenstein; which means that every detail of the daily life of the phthisical patient, with regard to food, drink, exercise, clothing, sleeping, etc., is regulated and fixed by medical authority.

First, as to the **food** of the phthisical patient.

In a disease like pulmonary consumption, attended with a chronic febrile condition, and consequent continuous loss of weight, unless this progressive wasting is counterbalanced by the supply and annexation of an adequate amount of food, the patient must, in course of time, succumb to the disease. It is well known that if we are able to establish an improved state of nutrition, the disease itself becomes favourably influenced thereby. Our success in this effort will depend much on the amount and type of the febrile state which accompanies the malady. When there are distinct intermissions or remissions in the febrile movement, and when the fever is quite moderate, we may succeed in procuring the assimilation of a considerable quantity of food, provided great care and discretion be employed in its selection and preparation. But when the fever is considerable and persistent, and the digestive functions (as is usually the case in such circumstances) are greatly impaired and appetite is entirely absent, it may be difficult or even impossible to obtain the appropriation of a sufficient quantity of food to exercise any adequate check on the wasting process. In such cases we are compelled to have recourse wholly to fluid and easily-absorbable foods in much the same manner as in the dietetic management of acute febrile diseases.

It is a generally-accepted rule that in the diet of the consumptive, fats and carbohydrates—*i.e.* the especially fattening forms of food—should be at any rate adequately, if not superabundantly, represented.

One of the greatest difficulties we encounter in providing a suitable and adequate diet for consumptives is the frequency with which they complain of digestive troubles, want of appetite, and, occasionally, of positive disgust for food. In such circumstances it is most important to provide well-cooked, appetising, and attractively-served food, varied as much as possible, and, so far as is consistent with wholesomeness, agreeable to the tastes of the patient.

Phthisical patients, whose digestive functions are unimpaired, may be allowed to partake of the various nourishing forms of food that enter into the ordinary dietary of the healthy, in addition to which two or three glasses of milk should be taken at convenient intervals between meals, and one of these glasses of milk should be taken the last thing at night, or even preferably during the night, if the patient is awake.

Cream * may also be made digestible and acceptable to many patients by mixing it with an equal quantity of hot water, and adding to each teacupful of the mixture a teaspoonful of the aromatic spirits of ammonia; some prefer a teaspoonful of brandy. In other cases we may use *peptonised* milk.

It is, perhaps, well to remember that the consumption of large quantities of milk, to the exclusion of other food, occasionally leads to troublesome constipation, and that this may often be remedied by mixing a little seltzer water with the milk.

Koumiss, or fermented mare's milk, has acquired a great reputation in Russia in the treatment of pulmonary tuberculosis, and the Russians resort in considerable numbers to those stations on the borders of the Caspian Sea, amongst the Kirghis and Tartar tribes, where the koumiss cure is carried on.

It is an appropriate beverage in febrile cases, as it quenches thirst, and can often be retained in the stomach when all other food is rejected; indeed, its especial value is in those cases of inveterate dyspepsia and gastric irritability in which all attempts at giving other kinds of food have failed. *Galazyme* and *kéfir* have been employed for the same purpose as koumiss.

The use of *raw* meat has been highly extolled, especially by some French physicians, and Professor Fuster, of Montpellier, has claimed the most brilliant results from its administration in cases of phthisis. These results have not, however, been confirmed by other observers, although it is generally admitted that in many cases of troublesome dyspepsia and loss of appetite, especially when associated with diarrhœa, raw meat has rendered real service.

The different kinds of farinaceous foods are all useful and appropriate articles of diet. Whole meal or well-made brown bread is, on account of the phosphates contained in it, better suited to young consumptives, if they digest it well, than white bread. Lentil flour is also valuable, as it contains notable proportions of phosphates and of iron. Oatmeal is rich in fatty matters, and the flour of maize is still richer—a fact which renders them both very suitable additions to the diet of the tuberculous.

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* We refer to fluid cream.

With regard to the use of *alcoholic beverages* much difference of opinion exists.

Some advocate the consumption of large quantities of alcohol in phthisis. Flint* quotes cases which appear to have been benefited by the consumption of as much as a pint of whisky daily! We shall find, practically, that the use and need of alcohol vary greatly in different individuals. In some it diminishes appetite and retards digestion; in others it promotes both; and we shall encounter very few cases of phthisis which are not benefited, at some period of their course, by the discreet administration of alcoholic stimulants.

It is noteworthy, that physicians, like the late Dr. Brehmer of Göbersdorf, and Dettweiler of Falkenstein, who have had quite exceptional experience of the daily needs of phthisical patients, use alcohol largely.

It is exceedingly necessary that the beverage, whether wine, spirits, or beer, should be pure and of the best quality.

When the patient is able to drink fermented *malt* liquors, he may be allowed one or two pints daily of good sound bitter beer, or porter, or stout; of wines, a half a pint to a pint of *really* good Bordeaux or Burgundy, or of some of the better descriptions of Hungarian, and Italian, or Greek wines.

In febrile cases, small quantities of alcohol given frequently have an excellent effect in supporting the strength; and especially during the night is it important to give two or three tablespoonfuls of brandy or whisky, alone, or with a little fluid food, such as milk, or beef-tea, or a whipped egg.

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* In his work on "Phthisis."

What is termed by French physicians "*alimentation forcée*"—*i.e.* forced feeding—is an expedient suggested by Dr. Débove, of Paris, for introducing food in large quantities into the stomachs of phthisical patients who have lost all appetite, or even acquired a positive repugnance for food.

Débove also maintains that his method of artificial alimentation, with or without a previous washing out of the stomach ("*lavage de l'estomac*"), with iced water, is a most efficacious measure for arresting the vomiting of phthisical patients.

Débove discovered, by accident, that in cases in which all food introduced into the stomach in the ordinary way was rejected by vomiting, food introduced by the œsophageal tube was, strange to say, retained; and on this observation he founded his method of artificial "*suralimentation.*" He finds he is able to introduce by this means into the stomach an "excess" of food which is retained and digested; and he truly observes, that a person with phthisis requires considerably more food than a person in health on account of the considerably greater bodily waste taking place. He has also observed that the digestive power of the patient has no relation to appetite. "A patient who has no appetite, or who has a marked disgust for all food, will digest perfectly a large meal introduced by the tube, and even at the end of a certain time will recover appetite." *

As the results of *suralimentation*, or excess of food, he has observed disappearance of night sweats, diminution and disappearance of cough and expectoration, increase of strength, rapid gain in weight, and at the same time a considerable amelioration in the physical signs.

By the use of powdered raw meat, Débove, and Dujardin-Beaumetz in Paris, and Peiper in Griefswald, have been able to apply the principle of *suralimentation* without the necessity of using the œsophageal tube.

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* "Leçons Cliniques et Thérapeutiques sur la Tuberculose Parasitaire," p. 82.

While we should do all in our power to encourage our phthisical patients to take an abundance of nourishing food (and for this purpose we should make their diet as varied and attractive as possible), we must be careful not to admit into their dietary forms of food which, although attractive to the patient, tend to exhaust his digestive forces without rendering him an equivalent amount of support and nourishment. We should, therefore, exclude pastry, uncooked fruits, salads, pickles, and all forms of indigestible food.

It would be undesirable to fix too rigidly the daily dietary of the phthisical, but the following scheme may serve as a general guide—a sort of plan of route from which wide excursions may be made under the guidance of a discreet physician :—

On waking in the morning, a tumblerful of milk should be taken mixed with a little hot water, to which it is often useful to add a few grains of common salt and bicarbonate of soda, especially when a certain amount of accumulated mucus has to be got rid of by expectoration. There is no objection to taking a little tea, coffee, or cocoa at this hour, with milk or cream, if preferred. Sometimes the stimulus of a tablespoonful of brandy, rum, or whisky is needed at this time. This first meal is often best taken in bed. About an hour afterwards a substantial breakfast should be taken, consisting either of broiled bacon and lightly-boiled eggs, or some fresh fish, or some cold meat or game or poultry, and with this meal milk, or cocoa or coffee or tea, or some good sound light wine and water may be taken, according to taste.

Supposing this meal to be taken about nine or ten o'clock, a glass of milk or a cup of beef-tea should be taken about noon.

Half-past one or two o'clock is a good hour for the chief meal of the day. This should consist of some fish when it can be procured fresh and good, together with some meat, chicken, or game, and fresh vegetables; and some light milk-pudding with a little marmalade or other cooked fruit. With this meal half a pint of good Hungarian wine, light claret, or Burgundy, or an equivalent quantity of brandy or whisky and water, may be taken.

At five in the afternoon another glass of milk should be taken, or a cup of thin chocolate, or tea with plenty of milk or cream; or the yolk of an egg beaten up with a little brandy and water may be substituted, if preferred. It is rarely desirable to order any solid food at this hour if it is intended that the patient should make another substantial meal at seven. At this hour a meal similar in all respects to that taken at 1.30 or two o'clock should conclude the substantial feeding of the day.

About half an hour before bed-time (which should not be later than 10 or 10.30 p.m.) another glass of milk, prepared in the same manner as that in the morning, together with one or two tablespoonfuls of brandy or whisky, or a cup of arrowroot, or beef-tea, or tapioca soup, according to taste, may be taken. And, finally, some provision of light nourishment mixed with a little stimulant, should be provided to be taken during the night, when the patient is wakened by coughing, or after perspiration, or when merely restless.

In distinctly febrile cases a much more fluid dietary will have to be followed, and the food will require to be taken at shorter intervals.*

Air and ventilation.—It is exceedingly necessary to watch over the respiratory functions of the phthisical, and to see that they breathe a pure untainted atmosphere. Wherever and whenever it is safe and possible to be altogether in the open air, there the sufferers from phthisis should be. Hence, the advisability of choosing their abodes and their apartments in

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* Fuller details as to feeding in phthisis will be found in the author's manual on "Food in Health and Disease."

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situations where free exposure to the open air is possible without the risk of encountering cold currents of air or other injurious agencies. At Falkenstein, Göbersdorf, and other sanatoria for consumptive patients, hammocks are swung among the pine trees around, and whenever the state of the weather will permit, the patients are encouraged to be in the open air as constantly as possible.

The advantage of a southern aspect for the sleeping apartment of the phthisical, in a situation sheltered from prevailing winds, is chiefly that the windows can be kept almost always open, and the apartment thus constantly kept filled with pure and fresh air, which the rays of the sun warm and vivify.

It is to the possibility of being much in the open air, even in winter, which *change of climate* often affords, that it owes its great value.

In advanced cases, when the patient is, of necessity, much confined to his room, a comfortable reclining couch should be provided, so that even if very feeble or feverish, he need not be confined too closely to his bed. The bed should be free from all hangings, and the coverings should be as light as is consistent with warmth, and they should be frequently changed. The temperature of the room should range between 62° and 65°, according to the feelings and condition of the patient. In very cold weather, when the temperature of a room quickly falls, and is often with difficulty renewed, a temperature of 65° will not be found too great for advanced cases. An open fireplace is the most cheerful source of heat, and it also promotes ventilation.

The importance of rest in bed during the intercurrent inflammatory attacks which not infrequently occur in the course of phthisis must not be overlooked; nor should we exhaust the little strength retained by the subjects of acute, or highly febrile forms of phthisis by too rigorous an insistence on open-air treatment; indeed, discretion and discrimination in this respect is as important as in the question of food.

All that we have here said points to the conclusion that a life in the country is almost essential to the successful treatment of phthisis, and yet we have seen some very satisfactory results in well-arranged houses in London.

This will be a convenient place to consider the utility and value of the **pneumatic treatment** in phthisis—a mode of treatment which has for its object the complete aëration and ventilation of the lungs, the promotion of the pulmonary circulation, and the removal of inflammatory exudations and infiltrations, by establishing a sort of lung gymnastic, either by the employment of portable apparatus, or by residence in the pneumatic chamber, or "compressed air bath." This method is no doubt valuable as a means of prophylaxis, but many Continental physicians maintain that it is efficacious also in the treatment of certain forms of chronic phthisis.

Jaccoud asserts that it should be applied, either by the portable apparatus or in the pneumatic chamber, during the whole period of the "initial apyretic phase" of phthisis. He prefers the apparatus* which allows of the inspiration of compressed air, and expiration into rarefied air. He maintains that its "minimum effect" is to retard considerably the extension of the disease, and this effect he believes to be constant; in a certain number of cases, in from six weeks to three months, he has observed a distinct diminution in the extent of the pre-existing changes so that they have receded to only one half their former extent; and in a few exceptional cases, falling under the category of apex catarrhs, he has observed an entire disappearance of all physical signs of disease.

Inspiration of compressed air leads to a more complete expansion and a more perfect ventilation of the lungs; it increases the intrathoracic respiratory pressure, and quickens the pulmonary circulation. The frequency of respiration and of the pulse is lowered, while the force of the latter is increased; an increased quantity of oxygen is absorbed into the blood, and an increased quantity of carbonic acid is expired; these conditions are favourable to the maintenance of nutritive activity, and unfavourable to the development of microbes.

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* For a full description of all the apparatus used in pneumatic treatment, see the author's translation of Oertel's "Respiratory Therapeutics." (Smith and Elder.)

Expiration into rarefied air leads to more perfect expiratory contraction, and consequently to a diminution in the residual air, and, therefore, to more complete pulmonary ventilation. Both processes tend to more perfect expansion and ventilation of the lungs, and more perfect aëration of the blood.

Judiciously-arranged gymnastic exercises, walking up gentle inclines, residence in elevated districts serve the same purpose, and may lead to the same results.

Bodily exercise is of all things most essential in the treatment of chronic phthisis, as without it nutrition languishes, and the bodily strength steadily diminishes.

Regular walking or riding exercise (always stopping short of fatigue), and slow, regulated climbing, bringing into play a certain amount of lung gymnastic, are most useful in promoting nutrition, limiting the spread of local disease and favouring retrogressive and curative processes, by promoting complete expansion of the sound portions of lung, and thorough pulmonary ventilation, and more perfect oxygenation of the blood. Consumptive patients should be taught in their out-door exercise to practise, from time to time, taking the deepest possible inspiration, followed by the completest possible expiration, and by this lung ventilation carried out with gentleness, and without any undue effort, they should be given to understand they make the best possible use of their opportunities of breathing pure, healing air!

When walking or riding is too fatiguing, carriage exercise, or exercise in a bath-chair, or in a rowing- or sailing-boat, on sea or river, is admissible in fine weather, provided undue exposure to cold currents of air is always guarded against.

We have spoken in the chapter on prophylaxis of the great importance of a *bracing, tonic treatment of the skin,* which is abnormally sensitive and impressionable in phthisical subjects; a treatment which is intended to diminish the tendency to chills which often react unfavourably on the lung condition. With this object in view many physicians who have had the special care of patients with phthisis, have been led to employ and advocate a modified **hydrotherapeutic course** in the management of the more chronic forms.

It is scarcely necessary to say that the application of the cold douche in such cases requires the greatest caution and circumspection. Sokolowski studied the effect of the cold water treatment on 105 patients with phthisis, at Göbersdorf, and he reported that out of these there were thirty-nine complete cures, thirty-four greatly benefited, nineteen slightly benefited, seven derived no benefit, two were made worse, and four died. He points out the necessity of great prudence in its application, and that it is only suited to those cases in which the local lesions are not extensive; that it is counter-indicated in cases of profound anæmia, in hectic fever, and in all cases which are not at once benefited by the first few douches. The douches should be of very short duration, commencing with 4 to 5 seconds, and increasing to 30 seconds with females, and 50 seconds with males. At Davos the application of cold douches of short duration to the chest has entered largely into the practice of some of the physicians there.

No doubt these cold douches of short duration have an excellent general invigorating effect on those who can support them, and who react vigorously to them, especially when they are commenced during the hot season; and they undoubtedly tend to strengthen the skin, and to remove that tendency to take cold from the slightest exposure which is so troublesome in the phthisical. But those, even, who are quite unable to support the cold douche may derive much benefit from cold or tepid general sponging of the skin in their own apartments, and it is often an advantage to add a little alcohol or eau-de-cologne, or toilet vinegar to the water used. Only a portion of the body should be uncovered and sponged at a time. But often the whole body may with advantage, once a day, be rapidly sponged over with cold water, provided this is done in a *warm* room. If, for the sake of ventilation and freshness, the patient's bedroom is not kept very warm, he should pass into a *quite warm* dressing-room before the cold sponging is applied. It is the combined contact of *cold air* as well as cold water that causes the latter to be ill-borne.

After the application of cold or tepid sponging the surface of the body should be well rubbed with a warm dry towel.

The **clothing** of phthisical patients should be light but warm ; light woollen material is the best. As they are usually very sensitive to cold currents of air and to changes of temperature, they should always have an extra wrap or warm covering at hand to put on when feeling the least chilly. It is a mistake to wrap up their chests, as so many do, with layer after layer of flannel, cotton wool, rabbit skins, "chest protectors," porous plasters, etc. When such a patient removes all these coverings you will often find the surface of the body wet with confined perspiration, in which the skin is, as it were, soaked, and rendered thereby much more sensitive.

All the clothing should be changed at night, and a thin flannel or cotton nightgown put on ; too much clothes must not be heaped on the bed, especially when there is a tendency to night sweats ; and when the bed-chamber is kept at a suitable and equable temperature a great quantity of bed coverings is not needed.

Invalids with confirmed phthisis, says an able authority on the treatment of this disease, "have but one resource in order to induce Death to forget them; it is to live quietly, as if in secret, and to live as little as possible; to make no display of a vigour they do not possess; to economise in everything—in their passions, in their pleasures, in their labours; to restrict themselves to a methodic regularity, to choose sobriety for their physician, and never to attempt to lead a mode of life to which their organic resources are not equal. The phthisical may thus, in husbanding their resources, lead a moderate and reasonable life. The life which is bought at this price may not seem a very enviable one, but it is the only one possible!" *

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* Fonssagrives, "Thérapeutique de la Phtisie Pulmonaire," p. 482.

CHAPTER VI.

CLIMATIC TREATMENT IN PHTHISIS.

Difficulty in Selection of Climates—Cases unsuited to this Treatment—Qualities required in a suitable Climate—Purity of Air the Chief—Objects sought in Change of Climate—Division of Climates—Examples of each Division—Value of Change of Climate as a Prophylactic—Marine Stations—Sea Voyages—Mountain Stations—State of the Lungs, etc., as Indications for Selection of Climate—Disease Limited and Localised—South African Resorts—The long Sea Voyage—Climate of Altitudes and the "Alpine Cure"—Its Characters and Effects—Cases Suitable—Need for Discrimination in Selection of Cases—Intermediate Stations—Cases with more advanced and serious Lesions and Chronic Cases—Egypt—Pau—Amélie—Division of Marine Climates into Sedative, Stimulating, and Intermediate—Characters of each, and Cases suitable to Them—Examples.

THE important part which **climate** plays in the treatment and progress of cases of phthisis is universally admitted. The application, however, of suitable climatic treatment to individual cases is often a question of extreme difficulty, and the attempts that have been made by some authors to classify climates according to their more or less theoretical views as to the variety of forms which this disease is considered to assume, will often be found, in practice, to be exceedingly delusive and unsatisfactory.

The choice of a particular climate for a particular case will, more frequently, have to be determined by individual and personal, rather than by general and pathological considerations.

"When," as we have written elsewhere,* "we reflect that cases of consumption are arrested in their course, and apparently cured, as they certainly have been, in such a climate, for instance, as that of Arcachon, on the coast of the Atlantic, and also in such an apparently utterly different climate as that of

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* "Climate and Health Resorts," p. 40, New edition.

Davos, we are led to the conclusion that we must seek for some *special relation* between the individual to be cured and the particular climate that will suit him. And it is sometimes only by actual trial that such relation can be discovered."

Even in the application of knowledge derived from actual experience of certain climates, we are often greatly disappointed, and the soundness of our judgment may in consequence be called in question, by the embarrassing capriciousness of weather, and the great variations of climatic conditions, in the same places, in different or successive seasons.

In the views, therefore, which we take of the influence and applicability of various climates in the treatment of different cases of phthisis, we should set ourselves free from the trammels of any narrow classification, and in attempting any generalisations in this complex subject, we should regard them as merely provisional and suggestive.

In connection with the recommendation of change of climate, the physician is often blamed for advising or rather permitting patients in advanced stages of phthisis to travel long distances, and to leave the comforts of home, when there is no reasonable hope of any decided benefit being thus obtained. No doubt the exercise of much judgment and discretion is needed in such circumstances, and while we should be especially careful not to impose useless fatigue and discomfort on our patients, and unnecessary expense and trouble on their friends, yet we must not forget that it is our duty to do what we can to take from death its terrors, and to render such life as is left to our patients as cheerful and bright as possible. The sadness and misery of the last few months of life are often greatly mitigated by removal from habitual surroundings which have become distasteful and wearisome, or from dull, cheerless city dwellings, to the contemplation of a landscape which presents all that is bright and beautiful in nature, and where illness and even death are robbed of many of their saddest accompaniments. We must not lose sight altogether of the moral and æsthetic influence of change of climate and of scene in these advanced cases.

It is, of course, almost unnecessary to say that cases of *acute phthisis* are not amenable to treatment by climate. Cases of rapidly progressing disease, especially with *diffused* infiltration on both sides, and considerable fever, are also to be excluded. All cases during attacks of intercurrent pneumonia, bronchitis, or pleurisy, with notable rise of temperature, should be kept at home. Cases presenting unmistakable evidence of progressive intestinal ulceration should not be permitted to travel.

With these few exceptions most cases of chronic phthisis may be more or less benefited during some considerable part of their course by climatic treatment.

With regard to the selection of a particular climate, and the conditions to be looked for in it, the absolute or relative purity of the air is, without doubt, the condition of chief importance. Compared with this, questions of small differences of temperature or of humidity are of far less concern.

It must have occurred to every practical physician of some experience, to have seen patients the subjects of chronic, stationary phthisis, with a good deal of bodily strength and activity, who for a long series of years will go from one health resort to another, differing widely in climatic characters, and will enjoy fairly good health in all.

We should learn from observations like these that we may allow some of our phthisical patients a great range of choice in the selection of a climate, provided it complies with the essential conditions of purity of atmosphere.

We have pointed out elsewhere* how the air over the open sea, and the air in elevated regions are alike in their freedom from the presence of organic impurities, and that, although their climates may seem to be, in a certain sense, opposed to one another, yet that, in some important respects, they are similar.

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* "Climate and Health Resorts," p. 40. New edition.

If, now, we ask ourselves what it is we desire to effect when we make use of change of climate in the treatment of phthisis, we may hope to get a clear view of the problem before us.

In the *first* place we utilise change of climate as a *means of prevention* in cases in which we have reason to apprehend a tendency to this disease.

Secondly, in cases where the local mischief is limited and quiescent, and the constitutional condition is good, we look for a climate which will promote retrogressive, curative changes, and at the same time increase the patient's strength, and restore him to perfect health.

Thirdly, in cases where the disease is more advanced, and the general health more gravely compromised, we desire to find a climate which shall contribute, if not to the retrogression, at any rate to the arrest of the disease, and to the restoration in some degree of the constitutional tone and vigour.

Fourthly, in still more advanced cases, where we have ceased to hope for any great general or local improvement, we desire to find a suitable place of residence favourable to the maintenance, if possible, of the *status quo*, and where the last years of the patient's life may be made as pleasant and comfortable to him as circumstances will permit.

Fifthly, we desire to find, in all these circumstances, comfortable, well-built, well-situated residences with the best hygienic conditions, with abundance of pure air and sunshine, and a dry soil, the means of obtaining a generous, nutritious, and varied dietary, and suitable medical supervision.

Let us next inquire what are the resources in the way of climate we have at our disposal for the purpose of meeting the foregoing requirements.

For our present purpose the first and simplest division of climatic stations will be into

A. CLIMATES OF ALTITUDES.—Mountain stations; these being usually several thousand feet above the sea.

B. CLIMATES OF THE PLAINS.—Stations on or about the sea-level.

These two main divisions may be again subdivided into—

A. (a) *Alpine climates.*—Mountain stations more than 4,000 ft. above the sea.

A. (b) *Sub-Alpine or "intermediate" climates.*—Stations ranging usually from 1,000 to 3,500 ft. above the sea.

B. (a) *Inland climates.*—Stations in the interior of continents.

B. (b) *Marine climates.*—Stations on the sea-coast, insular stations and sea-voyages.

We will now enumerate examples of all these so that we may have the question before us in a concrete form.

A. CLIMATES OF ALTITUDES.

(a) *Alpine climates.**—The stations of the *Upper Engadine,* Samaden (5,580 ft.), St. Moritz (6.032 ft.), Pontresina (5,950 ft.), Campfèr (5,950 ft.), Maloja (5,880 ft.), etc. *Davos Platz* (5,352 ft.). *Wiesen* (4,770 ft.), in the Valley of the Landwasser, near Davos. *Andermatt* (4,730 ft.), on the St. Gothard Road. *Leysin* sanatorium, near Aigle (4,700 ft.).

(These are the chief Alpine stations *in Europe* which are, at present, available for invalids in winter as well as in summer.)

Of other examples, out of Europe, the following may be mentioned:—

Jauja and *Huancayo* (8,000 to 10,000 ft.), in the Peruvian Andes; *Santa Fé de Bogota* (10,000 ft.), the capital of the United States of Colombia; *Quito* (10,000 ft.); *Cuzco* (11,250 ft.), in Peru; *La Paz* (12,000 ft.), Bolivia; *Mexico* (6,000 to 8,000 ft); *Puebla* (7,215 ft.).

In the United States of America there are *Denver* (5,200 ft.), *Colorado Springs* (6,023 ft.), and *Manitou Springs* (6,223 ft.), in the Rocky Mountains of Colorado, and other less well-known resorts.

In South Africa, *Bloemfontein* (4,700 ft.), and the adjacent stations in the Orange Free State, are the chief representatives of these Alpine climates.

(b) *Sub-Alpine or "intermediate" climates.*—There are but few European examples of this division available or suitable for winter as well as summer residence of consumptives. The chief are: *Grindelwald* (3,468 ft.), *Beatenberg* (3,700 ft.); *Les Avants* (3,212 ft.), *Glion* (2,400 ft.), and *Montreux* (comprising several villages of from 1,250 to 1,500 ft.), all three adjacent, on or near the Lake of Geneva; *Aussee* (2,145 ft.), in Styria; *Göbersdorf* (1,700 ft.), in Silesia, the well-known sanatorium, formerly under the supervision of the late Dr. Brehmer; *Falkenstein* (1,700 ft., about), in the Taunus Mountains, near Frankfort, also a sanatorium, like that of Göbersdorf, under the supervision of Dr. Dettweiler; *Meran* and *Untermais* (1,050 ft.), and *Obermais* (1,200 ft.), all three adjacent, in the Southern Tyrol.

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* For full descriptions of all these localities, see the author's work on "Climate and Health Resorts." New and enlarged edition. (Cassell and Co.)

To the above European resorts may be added the station of *Hammam R'irha* (2,000 ft.), in Algeria, and several resorts in South Africa (in Cape Colony and in the Orange Free State).

B. CLIMATES OF THE PLAINS.

(*a*) *Inland climates.*—There are very few inland resorts (apart from those in mountain districts) that have been thought suitable for the residence of phthisical patients. The Valley of the Nile, in *Egypt; Pau; Amélie les Bains*, in the Eastern Pyrenees; and *Biskra*, in Algeria, may be mentioned.

(*b*) *Marine climates.*—Under this subdivision we have an immense variety of stations to choose from, which themselves need classification, according to their temperature and its periodical oscillations, their humidity, their protection or exposure to winds, etc.

On the English coast we have *St. Leonards*, *Ventnor*, *Bournemouth*, *Torquay*, *Penzance*, *Falmouth*, *Tenby*, and others; in the South of France, *Arcachon* on the Atlantic coast, and the various resorts on the Western Riviera, together with the adjacent towns on the Italian Riviera; the many resorts in the Islands of the Mediterranean; *Ajaccio* in Corsica, *Palermo*, *Catania*, *Taormina*, and *Acireale* in Sicily; Corfu, Capri, Malta; *Malaga* on the east, and *Huelva* on the west coasts of Spain; *Algiers*, *Tangier*, *Mogador*, in North Africa; the Island of Madeira; Grand Canary and Teneriffe in the Canary Islands; Southern California in the United States.

From these and others, as well as the resource of a **sea voyage**, we have a wide choice of resorts suitable to individual cases.

These few preliminary considerations place the problem of the climatic treatment of phthisis fairly before us, and we may now pass on to consider in detail the various questions which arise in their application to individual cases.

The most valuable means at our disposal for **preventing** the development of phthisis in individuals in whom the predisposition to this disease exists, either from inheritance or from previous catarrhal, or other pulmonary attacks, or where the strength and resisting power of the constitution have been gravely compromised by severe attacks of acute disease, are those associated with change of climate.

In all such cases there is one essential and predominating condition to be fulfilled, as we have already said, and that is the selection of a climate in which an **out-of-door life** in fresh, pure air can be largely followed.

When we have to deal with this predisposition in scrofulous children, and young people, we should especially recommend a life on the sea coast, and when there is also a tendency to attacks of bronchial catarrh, or pulmonary congestion, we should recommend, *in winter*, the choice of a *southern* marine station, when practicable. An abundance of sunshine and sea air is most serviceable in such cases, and this is best obtained in winter in more southern latitudes than England.

A wide range of choice may, however, be permitted. On the Riviera, Hyères, Cannes, Bordighera, and San Remo are, perhaps, the best stations for such cases; for excitable, nervous constitutions, Arcachon, Biarritz, and St. Jean de Luz are better. With regard to Biarritz, it must, however, be remembered that there is often a great deal of rain as well as severe winds to be encountered there, in the winter, and it is not, therefore, well suited to cases in which catarrhal or other lung affection actually exists; and the life at Arcachon is dull for young people.

When, for other reasons, it may be more convenient, there is no objection in these cases to such winter stations as Gibraltar, Malta, or Madeira.

On the coast of England, Falmouth, Penzance, Bournemouth, Torquay, Ventnor, and St. Leonards are suitable resorts. Glengariff, on the south-west coast of Ireland, is also well suited to such cases. For young and fairly vigorous male adults one or two long sea voyages may be recommended.

Mountain stations, such as Davos and the Engadine, are especially suitable to cases or constitutions where it is desirable to remove an undue impressionability of the skin and mucous membrane, or where attacks of pleurisy or pleuro-pneumonia have been imperfectly recovered from, or where pleuritic adhesions hinder the complete expansion of portions of lung; the lung gymnastics which residence in these altitudes enforces are exceedingly useful in removing these conditions.

Young, vigorous adults belonging to this category may also be allowed to undertake an active out-of-door life in the various resorts in the elevated inland districts of Cape Colony, and especially the Orange Free State in South Africa, or in suitable parts of Australia and New Zealand.

As we have already said, a very wide range of choice, according to individual tastes, requirements, or peculiarities may be permitted to the cases that fall under this head.

We have next to consider the cases in which local mischief actually exists, but is **limited** and **quiescent,** and the constitutional condition good, and we are here in accord with Thaon* and G. Sée,† who regard the division of cases of phthisis, which so many authors adopt, in considering the adaptability of certain climates to certain cases, into "erethic" or "florid," and "torpid" cases as fanciful, and of little or no practical value. For us there is in each case of phthisis two chief objects to consider: first, the extent of diffusion of the more or less active specific infection agent; and, secondly, the various modes of reacting to its inroads presented by the different constitutions it invades.

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* "Clinique Climatologique." † "La Phtisie Bacillaire."

We recognise, in this way, two extreme types. There is, at one extreme, the constitution which succumbs immediately, and offers no kind of resistance to the infective invading organism, through whose tissues it spreads with amazing rapidity; these form the cases of so-called "acute phthisis," or "acute pulmonary tuberculosis."

At the other extreme we find constitutions which strongly resist the invasion of the infective organism, whose tissues appear to oppose its inroads, and lend themselves unwillingly to its diffusion. These are cases of very slowly advancing chronic phthisis; *chronic*, if one may say so, from its commencement!

Between these two extremes we encounter very various degrees of acuteness and chronicity, corresponding with the various degrees and modes of reaction of the constitution, or of the tissues invaded, to the invading parasite.

There are three easily ascertainable conditions which afford us a sufficient guide for the practical purpose of determining questions of climate; these are:

1. The local extent of disease, as ascertained by physical signs.
2. The rate of progress of the local disease and the mode of reaction of the constitution, as indicated by the amount of fever.
3. The presence of other pre-existing and co-existing morbid states or tendencies.

In considering the best kind of climate for those persons with a small, limited, local area of disease, little or no fever, good appetite and digestion, and plenty of physical vigour, and no complications, we must take into account other circumstances affecting the individual—such as age, sex, occupation, position in life, and personal tastes and peculiarities.

Young males accustomed to and fond of an active agricultural life, and not averse from a little "roughing it," may be recommended to one or other of the many stations in the elevated plains of South

Africa—in Cape Colony, the Orange Free State, or the Transvaal—where they will encounter a climate well adapted to this kind of life, one that has brought complete restoration of health to many.

The voyage to the Cape from England takes only sixteen or seventeen days, and is said to be "one of the finest in the world." It is often desirable, when practicable, to pass the summer in one part of the colony and the winter in another, as the climate of different parts, especially the coast and inland districts, varies greatly. "While the rains are deluging the coast lands in the winter months, about Cape Town, the train will convey you in a few hours to a frosty, clear, crisp air, where rain and moisture are unknown."

The environs of Cape Town, such as Wynberg and Kalk Bay, are especially suitable for summer residence (October to March), when the air is dry and pure, and the heat moderate. The invalid must not stay here during the winter, when there is much rain and a moist atmosphere, with frequent mist and fogs. Of inland resorts, Ceres is one of the most accessible; it is 1,700 feet above the sea-level, and only 84 miles by rail from Cape Town. At a short distance from this village is an elevated plateau 2,700 feet above the sea, with a fine dry, winter climate, and good opportunities for cattle farming. Its climate in winter is not, however, so good as that of some of the higher and more distant stations, but it serves as a good intermediate station for those arriving from Europe. One of the best of the higher resorts is the Cradock district, 3,000 feet above the sea, on the main line of rail between Kimberley and Port Elizabeth, and about 180 miles from the latter. It is one of the best sheep farming countries in the colony.

In the Orange Free State, which is an elevated plateau from 4,000 to 5,000 feet above the sea, with a remarkably dry climate, there are several resorts well suited for such cases as those we are considering. Bloemfontein, its capital, and Bishop, which is more accessible, are both suitable places of residence, and the latter is said to have "rarely a single wet day in the year."

These are all excellent resorts for cases of early phthisis in persons of otherwise good health, and possessing abundant capability of taking active exercise, and following an out-of-door country life. The disease should be limited, non-progressive, and quiescent, or but very slowly advancing, and with little or no fever; in many such cases a complete restoration to health and activity may be looked for, so long as the invalid remains in this climate. But South Africa should not be recommended to delicate persons who are dependent on luxuries and comforts, and quite incapable of "roughing it."

One or two long sea voyages, or a sea voyage to Australia or New Zealand, followed by an out-of-door life in suitable parts of the interior of these colonies, may be recommended to the same class of cases. We have not seen much advantage, but often great disappointment, follow the recommendation of sea voyages in more advanced cases, and in our own practice we never advise a long sea voyage except to vigorous young males, who like the sea, and have only a small extent of local disease.

Of the characteristics of a sea climate we have treated fully elsewhere.* In a long sea voyage to the Antipodes there are obviously many possible circumstances, which, if encountered, may prove injurious to invalids.

The resource of a sea voyage should, therefore, be reserved for the young and hardy patient who may be suspected of a phthisical tendency, or who may have some slight apical mischief, on one side, with little or no general constitutional disturbance. It is especially appropriate to those who are fond of the sea, and to those who may have opportunities of settling advantageously in the distant colonies of Great Britain.†

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* "Climate and Health Resorts."

† We desire to protest in the strongest terms against the common *routine* prescription of a "sea voyage" to young men the

The climate of altitudes, the "Alpine cure," is well adapted to the same class of cases, in somewhat altered circumstances, as the long sea voyage; but it is also adapted to a much larger group of cases, to many cases in which it would be out of the question to recommend a sea voyage.

We have pointed out elsewhere "that immunity from consumption does not follow any particular level of elevation, and that the *mere amount* of elevation is not so essential as had been supposed. The altitude of immunity varies in different latitudes. In the tropics it is necessary to ascend to an elevation of between 8,500 and 9,000 feet. In the Higher Pyrenees we are assured that at elevations varying from 1,760 feet (Bagnères de Bigorre) to 4,580 feet (Gavarnie), phthisis is equally rare. In Switzerland, some localities not more than 3,000 feet above the sea appear as free from phthisis as others of twice that elevation, and Dr. Brehmer asserted that in the neighbourhood of Göbersdorf, in Silesia (1,700 feet), he had never seen phthisis amongst the inhabitants; from which it would seem that the freedom which any particular locality may appear to enjoy from this disease is independent of its mere elevation, and due in part to other conditions." One of these conditions is undoubtedly entire physical purity of the respired air, the absence of microbes and other organic admixture. The localities which enjoy immunity from phthisis are characterised by the possession of a pure, dry, aseptic atmosphere, a dry subsoil, and a scanty population.

But in a truly Alpine climate, at an elevation of 5,000 feet or over, as that of Davos or the Upper Engadine, other conditions come into operation.

Besides being pure, dry, and aseptic, the air is rarefied, cold, and antiseptic. It is also peculiarly

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subjects of phthisis. It is both cruel and ignorant! We have just heard of two young men, one of whom we knew, who had been ordered a sea voyage, and who met in the same cabin in a sailing vessel; they both died long before the vessel reached its destination. This is a common experience.

still in winter (or rather we should say, in a *good* winter), and free from local currents, and the sunlight and heat, owing to the perfect clearness and transparency of the atmosphere, are intense.

We may summarise the physical agencies to which the invalid is submitted in these elevated regions, as follows:

1. Extreme purity of air and freedom from floating particles, especially of organic germs.

2. Great dryness of the air and of the soil, and therefore an unusual freedom in winter from mist and fog.

3. Low barometric pressure and corresponding rarefaction of air.

4. Low temperature of the air (great cold in the shade), with great solar radiation, or sun-warmth, which warms absorbent bodies exposed to its rays without heating much the air itself.

5. Great intensity of light during the hours of sunshine.

6. Remarkable stillness of the air in winter. (There is much more motion of the air, especially from local currents in summer.)

7. An increased amount of ozone.

Many theoretical views have been advanced with the view of accounting for the action of the cold rarefied air of these elevations on the human body; none of these have been altogether satisfactory, and we shall, therefore, confine ourselves in this place to noticing the effects observed to be produced in suitable subjects. These have been:

1. Increase of appetite, and improvement in the general nutrition and blood-making processes.

2. Increased tone of the heart and circulation.

3. A general increase of muscular capacity and nervous energy.

4. Increased ventilation of the lungs, owing to quickening and deepening of the inspirations, and the large quantity of pure cold air thus passed through them.

The amount of cold, dry air inhaled tends to a loss of heat, and so to diminution of fever, while the dryness of the air causes a considerable loss of water from the pulmonary surface, which, besides promoting the circulation through the lungs, tends to diminish secretion, so that moist catarrhal sounds disappear, and expectoration is diminished.

It has been said that in the process of amelioration and cure, the diseased parts of the lung become compressed by "emphysematous" dilatation of the surrounding tissue ; but it seems more probable (as it is certain that the circumference of the chest becomes increased from prolonged residence in these localities) that the permanent lung expansion is due to more complete dilatation of groups of air-cells which, probably, are little used in ordinary respiration on the sea-level, and so the whole lung expands within certain possible limits, and naturally fills up the space yielded by contracting, cicatrising lung substance.

The cases suitable for treatment in these elevated regions must be selected with great care and discrimination ; and regard must be had rather to the constitution and temperament of the individual than to the mere amount of local disease. Hereditary predisposition, other circumstances being favourable, offers no counter-indication to the suitability of these stations. But their remedial power is especially manifested in persons who have become accidentally the subjects of chronic lung disease, and who were the possessors of an originally sound constitution, and have obvious reserve stores of physical vigour : the constitution must have the power of healthy reaction to the exciting stimulants here applied to it.

In cases in which there is an obvious and well-ascertained *predisposition* to consumption, and where perhaps a slight hæmorrhage has occurred without the manifestation of any definite local disease, as a *preventive* measure, a residence for two or three seasons in a high mountain station is to be recommended.

In *catarrhal forms* of consumption, in the early stage, without much constitutional disturbance, the best results may be looked for. But cases, febrile from the commencement, and of nervous and excitable temperament, must not be sent to high altitudes.

Chronic inflammatory indurations and infiltrations of limited portions of the lung, often the result of acute congestion and inflammation, are especially suitable; not so, however, if a considerable extent of lung is the seat of tuberculous disease, or if, owing to the extent of lung involved and consequent changes in the sound lung, there is much difficulty of breathing.

We have, however, observed that advanced chronic cases, when the disease, though advanced, is limited to one lung, and there is little or no fever, and a certain amount of muscular activity and nervous energy is retained, often do well in these mountain stations; they will live there in tolerable comfort for years, losing ground, however, immediately they descend to lower regions.

Certainly chronic one-sided cavity cases, in fairly vigorous young subjects, with a tendency to fibroid changes in the surrounding lung, form very suitable and hopeful cases for high altitudes. Contraction of the cavity and cicatrisation of the surrounding lung substance, with expansion of the adjacent healthy lung tissue, often take place with considerable rapidity.

Notwithstanding all that has been said on the subject of the necessity for careful selection of cases, many unsuitable ones are sent to Davos and the Engadine, which live but a short time after their arrival, and some have even died on the road!

Several circumstances conduce to this: the chief of these is, perhaps, the great reputation which a residence at Davos has obtained as a *cure* for phthisis, so that it has become a widely-spread belief that while other climates may ameliorate one's condition, the *Davos* climate alone can *cure*, and both patient and doctor are therefore willing to incur some risk.

There is also a natural desire, when observing the progress of a sub-acute form of phthisis in a young person, to try whether the mountain climate will not stop its progress.

There is also another circumstance, and that is the great difficulty, especially in persons with large and capacious lungs, of detecting the precise extent of *diffused infiltrations;* these are often, we are convinced, very extensive without giving rise to any very definite physical signs, and such cases when sent to high altitudes suffer much from imperfect aëration of blood, owing to the rarefaction of the air and the small amount of pulmonary surface available for respiratory purposes.

The following is Dr. H. Weber's classification of *unsuitable* cases :—"(1) Consumptive patients who belong to what I have described as the erethic constitution whether the affection is early or advanced ; (2) phthisis in a very advanced stage ; (3) phthisis complicated with emphysema ; (4) phthisis complicated with albuminuria ; (5) phthisis complicated with disease of the heart ; (6) phthisis with ulceration of the larynx ; (7) phthisis with rapid progress and constant pyrexia ; (8) phthisis with great loss of substance ; (9) phthisis with considerable empyema ; (10) phthisis in persons who cannot sleep or eat in high elevations, or who feel constantly cold."

In this last group we are again brought into contact with individual peculiarity as a determining condition in the choice of climate ; for the members of this group who cannot exist in comfort, and whose nutrition is compromised in Alpine stations, we have to seek other residences ; some of these may do well in the so-called "intermediate" stations, such as Montreux, Glion, Meran, Göbersdorf, Aussee, etc., while others will find the warmer and more sunny climate of the stations of the Western Riviera more suitable.

Very little is at present known of the results attending the wintering of phthisical patients at **intermediate** stations. The Hôtel des Avants (3,200 feet) above Montreux, and the Kurhaus at St. Beatenberg (3,700 feet), and the Bär Hotel at Grindelwald have only of late years been kept open through the winter, and further experience is needed before it is possible to pronounce a judgment as to the suitability of those places as winter resorts for the phthisical. Meran (about 1,000 feet) has a cold, dry sub-Alpine winter climate, and many invalids with chest affections winter there with benefit. The Kurhaus there is provided with an excellent system of compressed air baths, and regular pneumatic treatment forms a part of the course carried out there. The several adjacent villages which compose Montreux at the eastern extremity of the Lake of Geneva, have been found suitable winter stations for a few cases of chronic phthisis in fairly vigorous persons who find that a cold, moderately dry, pure air, suits them best in winter.

We have mentioned that there are many suitable stations for consumptive patients at considerable altitudes in the American continent, for those who do not mind travelling as far as the Peruvian Andes, the Cordilleras, or the Rocky Mountains of the United States. Dr. H. Weber mentions that several of his patients "have recovered from rather advanced affections of phthisis," in the neighbourhood of Jauja and Huancayo, at elevations varying from 8,500 to 10,500 feet. These are the two chief resorts for consumptive patients from Lima. The climate of these stations is much more genial, and altogether very unlike that of the Swiss Alps at considerably lower elevations. The equability of temperature at Jauja is very remarkable; the range during a whole year has been observed "not to exceed from 50° to 59° or 60° F.; with the sky always clear and sunny, and an atmosphere pure and bracing." "From no other localities," says Dr. H. Weber, "have I seen such good results as from Jauja." *

Denver (5,200 feet), in the Rocky Mountains,

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* Croonian Lectures.

presents special advantages as a residence for a certain class of consumptives, for those we mean who cannot afford to lead idle lives, and who possess sufficient strength and energy to enable them to engage in active business pursuits. It is the capital city of the State of Colorado, and the chief business centre of the Rocky Mountains plateau But for those who do not wish to engage in business pursuits, and whose sole object is the restoration of health, Manitou (6,200 feet) and Colorado Springs (6,000 feet) offer superior attractions, as places of residence, to those of Denver.

The Yellowstone National Park, on the eastern slopes of the Rocky Mountains, has been mentioned as a possible health resort of the future, when consumptive invalids are crowded out of the high altitude resorts of Europe.

We have next to consider what are the best resorts for cases of phthisis in a **more advanced stage** than those we have been thinking of, or with the general health more seriously compromised ; as well as for those persons who from individual peculiarity, or other good reason, cannot support the climate of altitudes, or the more hardy life involved in a sea voyage, or settlement in an out-of-door life in one of the British colonies ; resorts which may contribute, if not to retrogressive changes, at any rate to arrest of the disease, and the restoration, in some measure, of constitutional tone and vigour. The resorts we now have to consider, will also frequently have to be made use of for cases of threatening disease in feeble constitutions, as well as for those lingering, advanced cases of chronic phthisis in which all hope of restoration to any kind of vigorous or active life is past, and in which our only hope is to maintain, if possible, the *status quo*, and to provide a refuge where the last years of the patient's life may be made as pleasant and comfortable as possible.

The extremely dry winter climate of Upper Egypt and Nubia, and the expedient of a voyage up the

Nile in a dahabeeah has, certainly, proved of great value to many sufferers from chronic phthisis. From November to April the climate of Egypt used to be considered "the finest in the world," but since attention has been so strongly diverted to mountain stations, the Nile voyage has come to be regarded with much less enthusiasm, and the long and expensive journey from England has always presented a difficulty, insurmountable in many cases.

The sea voyage, the shortest, from Brindisi to Alexandria, of three days, is also an obstacle to many. The view taken of Nile voyages by Professor G. Sée, viz. that they "end by exhausting invalids, in consequence of defective food, a profound melancholy, and a dust-laden air, which compel them to return to Italy, where they find the grave they have anticipated," is certainly too gloomy.* Rohden, on the other hand, admits that "well-ascertained cases of healed cavities in the lungs, in not very excitable constitutions," † speak in favour of the climate. The winter climate of Egypt is suitable to cases of chronic, stationary phthisis in persons of torpid or scrofulous constitution, with catarrhal tendencies, who are active enough to enjoy travel. The command of a certain amount of means is also necessary, and if they venture on the Nile voyage they should be accompanied by a medical attendant. They should be cautioned about remaining long in Cairo, where the dust and dirt may prove injurious; but good accommodation can now be obtained at Heluan les Bains, a few miles from Cairo, and in Cook's hotels at Ména and Luxor.

Pau has also an inland climate, but with very different characters to that of Egypt. Pau has a moist, sedative climate, Egypt a dry, exciting one. Remarkable stillness of atmosphere is considered to be the chief characteristic of the climate of Pau. It has a large rainfall, and a goodly number of rainy days. Its average winter temperature is but little higher than that of London—viz. 43·2° F., and it is occasionally visited by severe storms, and frost and snow are by no means uncommon in winter. It must be remembered that its climate is sedative, and not bracing, and that its special suitability is to phthisical patients whose disease is quiescent, with irritable nervous systems, and a tendency to febrile excitement.

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* "De la Phtisie Bacillaire," p. 411.

† "Treatment of Phthisis by Baths and Climate."

It is an agreeable place of residence, and has many social attractions. Its adjacency to the several Pyrenean summer resorts and sulphur spas is convenient for a large class of invalids who pass their winter at Pau and their summer at Eaux-Bonnes, Bagnères de Bigorre, or some other Pyrenean baths.

Amélie les Bains is another inland winter resort for the phthisical, almost exclusively frequented by French and Spanish patients. It is close to the Spanish frontier in the Eastern Pyrenees. It lies in a protected situation at an elevation of 700 feet above the sea; its climate is intermediate in character, between the sedative one of Pau and the more exciting one of the Riviera. It is warmer than Pau, but has more wind, and its temperature is less equable. It has hot sulphur springs, and it is, therefore, a convenient winter resort for patients with phthisis, who desire to combine the use of sulphur waters with a mild winter climate. Life at Amélie is very simple and inexpensive. One of the largest military hospitals in France has been established there.

The **maritime**, insular or littoral climates convenient and suitable as winter resorts for the phthisical may be divided into three groups:—(*a*) sedative marine climates; (*b*) stimulating marine climates; and (*c*) intermediate climates.

The practical selection and applicability of these climates must be determined rather by considerations of constitutional and individual peculiarities than by considerations drawn from the physical changes in the lungs. The influences of climate and their reactions on certain individuals are so subtle that it is scarcely possible to determine absolutely, before actual trial, in these doubtful cases, whether a particular resort will be found suitable or not.

The *sedative* group are characterised by greater equability of temperature, greater freedom from strong winds, a considerable amount of relative humidity, and generally a tolerably large rain-fall distributed over a considerable number of rainy days. The *stimulating and tonic* group present wide diurnal variations of temperature, and considerable difference between sun and shade temperatures, a great fall of temperature at sunset, relatively cold nights, great sun heat, frequent high winds, a small winter rain-fall, and relative dryness of atmosphere.

The characteristics of the third or *intermediate* group are sufficiently indicated by their designation; it is, however, scarcely necessary to say that some examples of this group approach more nearly to the sedative, and others to the stimulating class.

So far as it is possible to generalise in this matter, it may be said that the climates of the sedative group are best suited to nervous, irritable constitutions, which sleep and digest badly in exciting air, whose mucous membranes are irritated by sudden changes of temperature, and exposure to strong winds, or by excessive dryness of atmosphere.

The *stimulating* tonic group are best suited to young anæmic cases, and to torpid scrofulous constitutions, in which the variability of temperature, the dry air, the bright sunshine, and the changing winds, serve as stimulants to the languid circulation, and promote nutrition and sanguification; while the *intermediate* group form a very valuable class of climates applicable to a very wide range of cases, in which there is no very strongly marked individual peculiarity, certain members of this group being applicable to the same cases as the other two, according as they approach in their characteristics the one or the other division.

A brief reference to the principal examples of these groups will suffice to guide the practitioner in the selection of a suitable resort.

On the English coasts the winter resorts suitable for phthisical patients belong most of them to the sedative class; differing slightly from one another, but not greatly. Those to the west—Falmouth, Penzance, Torquay, Tenby—are more sedative than those to the east—as Ramsgate, Hastings, and St. Leonards; while Ventnor, Bournemouth, Sidmouth, and Teignmouth may be regarded as intermediate.

Patients who do not tolerate too close proximity to the sea can, at Bournemouth and Torquay, find suitable accommodation at some distance from the shore. The sandy soil and the pine woods of Bournemouth confer on it some special qualities; the rainfall rapidly drains away through the porous soil, and leaves the atmosphere therefore somewhat drier than it otherwise would be, and the pine trees give out balsamic emanations in warm sunshine—both circumstances favourable to catarrhal cases and cases of laryngeal irritation.

St. Leonards is specially adapted to those persons who complain that they find the atmosphere of Torquay and Bournemouth too relaxing, and who derive positive benefit from a somewhat more bracing quality of climate.

The success that has attended the treatment of a great number and variety of phthisical patients at Ventnor, in the admirably arranged and well conducted Hospital for Consumptives established there, shows that its winter as well as summer climate is well suited to the majority of cases of chronic phthisis.

Arcachon, on an enclosed sea basin, a few miles from the south-west Atlantic coast of France, is applicable to much the same class of cases as is the English resort Bournemouth. It has a decidedly sedative climate, but it cannot be said to be relaxing, as the winds and storms from the Atlantic blow over it, and at times keep up a good deal of agitation in its atmosphere. The winter residences are, however, protected to a great extent by the pine woods amongst which they are built. It is a rather dull resort to pass the winter in, but it has the advantage of being easily got at and easily left.

Biarritz is far too windy, wet, and stormy a climate for the average phthisical patient to think of wintering in.

One of the most perfect of sedative marine climates is that of Madeira, with its warm, moist, and equable atmosphere, exceedingly suitable to certain forms of phthisis, especially those with a tendency to bronchial catarrh and irritability. It has the further advantage of enabling patients to ascend during the warmer season to residences at various elevations above the sea, up to 2,000 feet or more, so that certain patients can remain there the whole year—an important consideration in many cases.

Mogador and Tangier, in Morocco, possess much the same climatic qualities as Madeira, with a somewhat drier atmosphere, and somewhat less sedative qualities. Fair accommodation may be obtained at the latter resort, but it would not be prudent to rely on finding suitable provision for invalids at Mogador.

Malaga would be an admirable resort for many cases if it were not so ill-provided with suitable means for invalids to live an open-air life.

Of late years Orotava, in the Island of Teneriffe, has been advocated as a good winter station for the phthisical. It is situated about twenty-eight hours' journey from Madeira, and like that island presents the possibility of residence at varying degrees of elevation above the sea, and has extremely beautiful and picturesque surroundings.

Las Palmas, in Grand Canary, has a drier and more bracing climate, and is preferred, therefore, by some.

Ajaccio, Palermo, Taormino, Acireale, Catania, Corfu, Capri, are examples of intermediate climates suitable to cases of chronic stationary phthisis that find the resorts of the Riviera too dry and exciting, and yet require a drier atmosphere than that of Madeira.

The climate of Algiers is also an example of the intermediate group, and is applicable to a great number of cases. The agreeable situation of its suburb—Mustapha-supérieur—where most invalids take up their abode, combines the advantage of life in the country with the adjacency of a large town. It is possible, too, to stay through the entire year in Algiers, either by removing to Hammam R'irha during the hottest months of summer, or by remaining in the highest part of Mustapha.

Biskra, for those who need a warmer and drier climate than Algiers in winter, is readily reached from the latter.

The various resorts on the French and Italian Riviera present us with examples, differing in certain degrees from one another, of the stimulating and tonic group.

We have already pointed out their characteristics, and the class of cases to which they are applicable, and for a full description of the several places of resort we must refer to what we have written elsewhere.*

Finally, we will only add that, according to the mode of life followed by the phthisical patient, he may make *bad* use of a *good* climate, or *good* use of a *bad* one.

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* "Climate and Health Resorts."

Part V.

THE TREATMENT OF DISEASES OF THE LIVER.

CHAPTER I.

THE TREATMENT OF GALL-STONES (CHOLELITHIASIS).

Frequency of Biliary Concretions in the Gall-bladder—Their Origin—Composition—Characters and Structure—Etiology—The Neurotic Constitution—Changes in the Composition of the Bile—Catarrh of Bile ducts—Influence of Food Habits—Want of Exercise—The Gouty Diathesis—Bacteria—Corpulence—Age—Female Sex—Pregnancy—Tight-lacing—Symptoms—Attacks of Biliary Colic—Pain—Rigors—Rise of Temperature—Vomiting. Jaundice—Passage of Calculi in Fæces—Indications for Treatment. 1st. *During the Crises*—Hypodermic Injection of Morphine and Atropine—Opium by the Stomach—Chloroform Inhalation—Chloral Hydrate *per rectum*—Local Applications, Fomentations, and Poultices—Copious Warm Alkaline Drinks—Belladonna and Podophyllin—Leeches—Ether, Ammonia and Brandy for Collapse—Ice to allay Vomiting—Testimony in favour of Olive Oil in large doses—Turpentine. 2nd. *During the Intervals.*—Manipulation of the Gall-bladder—Aperients—Warm Alkaline Drinks—Cholagogues—Courses of Mineral Waters, Carlsbad, Vichy, etc.—Sodium Salicylate—Diet and Regimen—Indications for Surgical Interference—(*a*) Sounding, (*b*) Aspiration, (*c*) Cholecystotomy, (*d*) Cholelithotrity, (*e*) Cholecystectomy, (*f*) Cholecystenterostomy. Additional Formulæ.

In reviewing **diseases of the liver** from the standpoint of clinical therapeutics we are compelled to set aside certain of these affections as either wholly uninfluenced by treatment, as for instance that rare malady, *acute yellow atrophy*, or as presenting only *general symptomatic* indications, as cancerous, sarcomatous or other new growths in the liver, or as simply forming part of a general constitutional morbid state, as the *amyloid liver* and the *fatty liver.*

The morbid states associated with the liver which chiefly concern us now are:—1. *Gall-stones* or *cholelithiasis;* 2. Certain forms of *jaundice;* 3. *Hyperæmic states* or *congestions;* 4. *Acute and chronic inflammations; abscess; cirrhosis;* and 5. *Hydatid cysts.*

Biliary calculi are of common occurrence in the gall-bladder, and these concretions are often found in that organ in considerable numbers, after death, without having given rise to any symptoms during life dependent on their presence there. Single concretions, large enough to fill the whole cavity of the gall-bladder and moulded to its shape, are occasionally found. These large biliary concretions occasionally ulcerate their way through the coats of the gall-bladder into the intestine (to which the gall-bladder has, previously, become adherent), and they may then be evacuated by the bowel, or may lead to symptoms of intestinal obstruction. Sometimes gall-stones ulcerate through the gall-bladder into the peritoneal cavity and set up diffuse peritonitis which may prove fatal. Sometimes adhesions form between the gall-bladder and the abdominal wall and external fistulæ are formed through which these concretions are expelled. We have ourselves recorded a case in which numerous gall-stones had passed out of the gall-bladder and become infiltrated into the abdominal wall, and a great number of these were removed from the sinuses they occupied by Sir Joseph Lister.

But the symptoms dependent on *gall-stones* which usually call for treatment, are those caused not so much by the existence of those concretions in the gall-bladder, as by the passage of one or more of them along the cystic and common bile ducts into the small intestine. So long as these concretions remain quietly in the gall-bladder, they may give rise to no symptoms whatever, and, indeed, they occasionally pass through the bile duct into the intestine and out of the body without giving rise to any symptom, especially when they are small, or when, possibly, the duct is abnormally large, or has become distended by the previous passage of larger calculi. The symptoms which usually call our attention to the existence of gall-stones are either **pain** excited during the passage of the calculus along the cystic and common bile ducts, or **jaundice** from obstruction to the passage of the bile into the intestine by the blocking up of the duct by the concretions, or, most commonly, both.

A few remarks as to the composition, origin, and symptoms of gall-stones will fitly precede a detailed consideration of the treatment they require.

Biliary calculi are almost invariably formed in the gall-bladder; occasionally, though rarely, they are formed within the hepatic ducts. They vary greatly in size. As we have already said, a single stone may be large enough to fill the whole cavity of the gall-bladder; on the other hand, they are often so small as to be scarcely larger than grains of sand or small shot. These small, black, rough, irregular-shaped calculi are often spoken of as *biliary sand* or *gravel.* Between these extremes all degrees of size may be found. The smaller stones may be exceedingly numerous, as many as a thousand and upwards have been found in a single gall-bladder. The dark, smaller kinds are composed almost entirely of bile pigment; they are soft and can easily be crushed to a coarse powder. The larger ones are composed chiefly of cholesterin mixed with bile pigment. When numerous they become facetted and angular from mutual contact and friction. Sometimes they are of soft consistency and are easily crushed; at other times they are hard and incapable of being crushed. Most commonly they have a yellowish-white or fawn-coloured surface, and on section they are seen to be composed of concentric layers with radiating lines; the pale superficial layers are usually succeeded by a dark band separating them from the deeper layers which are mostly of a dark yellow or brown colour, due to bile pigment. Some lime salts are found in the outer layer, but the majority of gall-stones contain

70 to 80 per cent. of *cholesterin*, mixed with bile pigment. The central nucleus is usually formed of bile pigment; some think the nucleus originates in a fragment of inspissated mucus impregnated with lime salts, which attracts bile pigment, and that around this cholesterin is slowly deposited.

What are the **causes** which determine this precipitation of cholesterin and bilirubin chalk so as to lead to the production of gall-stones? This is a difficult question to answer, for the mode of origin of gall-stones is involved in great obscurity. According to Dujardin-Beaumetz there are two conditions which may determine the precipitation of cholesterin, viz. either the presence of an excess of cholesterin in the bile; or, the amount of cholesterin being normal, the existence of some alteration in the other elements of the bile which leads to its precipitation. If we suppose it to be due to an excess of cholesterin in the bile, this, it is suggested, may be traced to nervous disturbances, especially those of an emotional nature, cholesterin being regarded as a product of nervous waste. This view is supported by the clinical observation that gall-stones are especially prone to appear in neurotic women, and it may be that over-excitement of their cerebro-spinal nervous system leads to an excessive formation of cholesterin and to its precipitation in the gall-bladder.

But although the subjects of gall-stone are often found amongst nervous women, they occur also with tolerable frequency in persons who have no neurotic tendencies whatever, and in such cases we must look for some other explanation. The amount of cholesterin in the bile being normal, it has been suggested that its precipitation may depend on some other chemical modification in the composition of the bile, such, for instance, as a diminution in the sodium salts; or the presence of chalk (as from drinking hard water) might determine the precipitation of the colouring matter (bilirubin chalk). Again, it has been asserted that a too exclusively animal diet will cause the normally alkaline bile to become acid, and that in such acid bile a deposition of cholesterin is apt to occur. It has further been suggested that a catarrhal condition of the bile ducts* may play an important part in the origin of biliary concretions, as inspissated mucus is found frequently to form part of the nucleus of such concretions.

The female sex predisposes to attacks of gall-stones, and statistics show that nearly four and a half times as many women as men suffer from this affection. This may be due, in part, to the more sedentary life women lead, or the constriction of the waist by tight-lacing, etc., may be a cause. The consumption of large quantities of fatty food has been, probably without sufficient grounds, held responsible for the production of gall-stones, for those races that live almost exclusively on fats have not been found to be specially subject to this malady.

Frerichs held that very long intervals between meals favoured the formation of biliary concretions. During digestion the bile flows freely into the small intestine, and the gall-bladder gets rid of a great portion of its contents; but if the meals are very far apart, there will be a tendency to stasis of bile in the gall-bladder, which would favour the deposition of cholesterin. Habitual constipation will have the same effect.

Sedentary habits and want of exercise, by diminishing the respiratory activity and the movements of the diaphragm and the abdominal viscera, must obviously tend also to promote stasis of bile in the gall-bladder, and, at the same time, by diminishing the combustion of fats, lead to a modification in the biliary secretion favourable to deposition of cholesterin. Persons who inherit the gouty diathesis are considered specially prone to biliary as well as to renal calculi, and Beneke considered he had established a relationship between this affection and the occurrence of arterio-sclerosis. We have had occasion to notice that persons who perspire freely, and therefore lose much fluid from the cutaneous surface, and who drink but sparingly of water and other diluent fluids, are prone to become the subjects of calculous deposits both biliary and urinary. We have also seen some remarkable instances of the influence of heredity in the causation of this disease. It has recently been suggested that a *bacillary* growth in the bile may determine the formation of gall-stones.

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* Mayo Robson says, "Very probably catarrh of the gall-bladder and its ducts is the beginning of many cases of cholelithiasis: a piece of mucus or a mass of epithelium forming the nucleus around which cholesterin and other bile solids are deposited." ("On Gall-Stones and their Treatment," p. 53.)

The common statement that the very corpulent are most prone to attacks of gall-stones is not consistent with our own experience, and in Beneke's extensive observations this coincidence was very rare. The majority of patients who have sought our own aid for this malady have been very spare subjects, and some of them have been accustomed to very active exercise.

Age has a determining influence, and post-mortem examinations have shown, that while gall-stones are found in only 2·7 per cent. of the bodies of those who die between fifteen and thirty, 5·9 per cent. are found in those between thirty and sixty, and 15·2 per cent. in those over sixty. In the latter, feebleness of circulation leads to "diminished secretion from the bile passages, and, as a consequence, stagnation and inspissation of bile" (*Mayo Robson*).

Pregnancy seems to favour the deposition of biliary concretions probably by compression of the excreting ducts; Naunyn has stated that 90 per cent. of women with gall-stones have borne children, and from this fact he concludes that stagnation of bile in its passages is the most distinct cause of gall-stone. Tight-lacing also interferes with this free flow of bile. Mayo Robson considers tight-lacing of more consequence than pregnancy, as young women under thirty suffer from the disease four times more frequently than men of the same age.

The frequency with which gall-stones are found in connection with gastric and hepatic cancer may depend either on pressure, or on the co-existence of catarrh of the bile ducts ;* but some physicians believe that gall-stones are not only the frequent precursor, but the actual cause of malignant disease. There still, however, remains, as we have already said, much obscurity about the origin of gall-stones.

The **symptoms** of *gall-stones* are chiefly those attendant on the attacks of *biliary colic*, which arise during the passage of concretions of a certain size along the excreting ducts, or are determined by their impaction there. These attacks usually occur suddenly, probably at the moment when a concretion passes from the gall-bladder into the cystic duct and becomes arrested there. The pain is usually excessively severe, and starting from the region of the gall-bladder, extends from the right hypochondrium over the whole abdomen, and may shoot through to the back and right shoulder. The abdominal muscles are contracted, and there is often great tenderness over the region of the liver, and this organ may be enlarged. The severe pain is usually attended with great distress and restlessness. The pulse is small, the face is pale and pinched, the skin cool, and drops of cold perspiration often stand out on the forehead. The pain is sometimes so severe and agonising as to cause the patient to faint, and it has been known to cause acute mania and even to be fatal.† Rigors are sometimes observed with rise of temperature to 102° or 103° Fahr. Obstinate sympathetic vomiting often accompanies the attack. The intense pain is doubtless due to the slow and difficult progress of the stone along the cystic duct, or to the distension of the narrow duodenal orifice of the common duct. After a few hours, but sometimes much longer, the sufferings are usually moderated, and this remission probably corresponds with the passage of the calculus from the cystic duct into the common duct, as this is a somewhat wider canal, which becomes, however, narrower at its termination in the duodenum. When the concretion has escaped through the orifice of the common duct into the duodenum, the attack suddenly ceases. This sudden and complete relief of the pain and distress is very striking. In some instances the pain does not cease so suddenly, some irritation of the distended ducts still remaining.

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* We have recorded a case of pyloric scirrhus which was regarded by some eminent physicians as a case of gall-stones, and some dark roundish bodies were shown as having been passed at Carlsbad, but these showed none of the characteristic appearances on section of gall-stones, and none were found in the gall-bladder after death.

† *Vide* case quoted by Mayo Robson. At the autopsy a gall-stone was found "half extruded into the duodenum." ("Gall-stones and their Treatment," p. 77.)

Jaundice does not of course appear until the calculus has reached the common duct, and it is sometimes entirely absent; if the concretion is impacted in the common duct for a short period only, the jaundice will be slight, but if it should remain long impacted at the orifice of the common duct, the jaundice becomes intense; the gall-bladder becomes distended, the liver enlarged, and sooner or later symptoms of toxhæmia appear. The calculus (sometimes there are several) having passed into the duodenum, can usually be found in the fæces by careful examination.* If no calculus is found after the cessation of an attack of biliary colic, it is always possible that the stone may have slipped back into the gall-bladder. Impaction of a gall-stone in the cystic duct, although unattended with jaundice, may give rise to tumour of the gall-bladder from accumulation of secretion in it.

What leads to the passage of the stones out of the gall-bladder into the cystic duct we do not know, nor why in some persons these concretions should remain all through life in the gall-bladder, giving rise to no symptoms.

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* The motions should be passed into a solution of carbolic acid, then well stirred, and passed through a fine sieve with about $\frac{1}{16}$-inch mesh.

Vomiting is a common symptom during attacks of biliary colic, and may occasionally lead to relaxation of the duct, and if the concretion be small it may pass on and so terminate the attack.

In cases attended with jaundice, after the attack of colic has passed off there often remains, not only great lassitude, but entire loss of appetite, nausea, with tendency to vomiting, emaciation, and dark, bile-stained urine.

Some authors describe attacks of a slighter kind, which they believe to be dependent on the passage of biliary "grit" "or sand" (*gravelle hépatique*) along the bile ducts, setting up a certain amount of irritation of the mucous lining of the ducts, not, however, reaching the intensity of an attack of biliary colic. Such patients complain of epigastric pain and discomfort, with disturbed digestion, often with slight feverish attacks coming on in the afternoon, a subicteric tint of skin, and tenderness on pressure over the region of the gall-bladder.

The *indications* for **treatment** may be considered under two headings:—1. During the crisis; and 2, during the intervals.

1. The indications for treatment during the paroxysms are:—

(*a*) To relieve or calm the distressing symptoms; and

(*b*) To promote the expulsion of the calculus or calculi in the ducts, especially when the attacks are prolonged.

2. During the intervals, the indications for treatment are—

(*a*) To prevent the formation of concretions;

(*b*) To promote the discharge of those remaining in the gall-bladder; or,

(*c*) If possible, to further their solution.

It is extremely doubtful if any medicines taken into the stomach can possibly lead to the solution of the larger concretions already formed in the gall-bladder. But it seems quite possible that by modifying, to a certain extent, the physical and chemical properties of the bile, which we may be able to do, we may prevent the further deposition of cholesterin, and also hinder the increase in size of the calculi already in the gall-bladder, or even promote the solution and softening or disintegration of the smaller forms of hepatic "gravel;" and, when the bile ducts have been dilated by the passage of large calculi, as proved by their recovery from the fæces, we may hope to promote the almost painless discharge of such smaller ones as still remain in the gall-bladder.

After we have considered how these indications may best be fulfilled by medical treatment we shall consider briefly the circumstances that may render it necessary to have recourse to surgical interference.

First, with regard to the **treatment during the paroxysm.** We must remember that the walls of the excretory bile ducts are furnished with involuntary muscular fibre, and therefore they can be excited to spasmodic contraction; that these ducts are lined with an exquisitely sensitive mucous membrane, and the contact and pressure of a foreign body, such as a gall-stone, while it excites, as we know, great pain, no doubt provokes also reflex spasmodic contractions of these involuntary muscular fibres, so that there is as it were an active as well as a passive resistance to the transit of the gall-stone along the gall-ducts. To remedy these conditions we require the aid of medicinal agents which shall produce an anæsthesia of the sensitive and excited mucous membrane, and a relaxation or paralysis of the reflexly excited muscular fibres. Clearly this is the first and most direct indication; we may, at the same time, or subsequently, attempt to increase the flow of bile so as to mechanically dilate the gall-ducts and facilitate the passage of the calculus by a sort of *vis a tergo*.

The most rapid method of relieving the pain and the sensitiveness and spasm of the bile ducts is by the hypodermic injection of morphine, and it acts best, we consider, when combined with atropine; a $\frac{1}{4}$ or $\frac{1}{3}$

grain of sulphate or acetate of morphine, with $\frac{1}{120}$ grain of sulphate of atropine may be administered at once, and repeated after an hour or two if needful. We must be alive to the fact that there are individual peculiarities with regard to the toleration of morphine, and it is therefore well to begin with small doses. Some tolerate it well and require larger ones. If there is not very constant vomiting, opium or morphine may be given, in combination with some gastric sedative, by the stomach, and it often acts extremely well so administered, calming the reflex gastric irritability as well as relieving the local pain. We may give morphinæ hydrochlor., $\frac{1}{6}$ to $\frac{1}{4}$ grain, succi belladonnæ, 20 minims, acid. hydrocyanici dil., 5 minims in aquæ chloroformi 1 oz. This draught might be repeated, if necessary, after two or three hours. To persons who bear morphine badly this is a far safer mode of giving it than by hypodermic injection, owing to the very rapid absorption of the drug in the latter case.

If the pain is excessively severe, it may be desirable to administer a little chloroform by inhalation,* until the morphine has time to act; or if the morphine fails to relieve, we may have recourse to chloroform or ether inhalations.

It has been objected to the use of morphine and opium that they diminish the flow of bile, and that, therefore, in these cases chloroform inhalation is better, or hydrate of chloral given *per rectum.* But although morphine does no doubt diminish the secretion of bile, it seems to do so less when combined with atropine, and we have no agent at all equal to it for the sustained relief of pain and removal of spasm. The first step in the treatment of biliary colic should then, we consider, be the administration of morphine or opium. Warm baths and warm fomentations, and mustard poultices applied to the right hypochondrium and to the epigastrium have been recommended, and are doubtless useful aids in relaxing spasm and relieving pain, but they are of very little use alone, and when combined with sedatives it is difficult to say what is their precise share in producing the relief afforded. A measure which we never fail to apply, and which has been warmly commended by some of the most experienced physicians, is to cause the patient to drink large draughts of hot water, in which some sodium bicarbonate has been dissolved, and we now add some sodium salicylate; 60 grains of sodium bicarbonate and 20 grains of sodium salicylate should be dissolved in a pint of hot water, and the patient should be made to drink this in mouthfuls. If it is vomited at first, it should be persevered with until it is retained, and it should be frequently repeated until the attack has passed away. This drink not only serves the purpose of diluting and promoting the flow of bile, but it acts as an internal warm fomentation (and it should be drunk as hot as possible) which probably reaches the duodenum. It is especially valuable as a corrective to the morphine, for it promotes the flow of bile by increasing its fluidity, and so favours the mechanical urging forward of the calculus through the bile ducts after the spasm has been allayed by morphine.

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* It can be easily and conveniently given poured on the sponge of one of our inhalation respirators. (*See* vol. i. p. 499.)

Dujardin-Beaumetz recommends for milder cases the use of suppositories of extract of opium ($\frac{1}{3}$ grain) and extract of belladonna ($\frac{1}{6}$ grain), in cacao butter; but the case must be very mild, and the pain not at all urgent for this prescription to be of avail. He also speaks highly of chloral, given in doses of 30 to 48 grains in a *lavement* mixed with the yolk of an egg and a glass of milk, but he admits that when there is much abdominal pain it is rarely retained. He also suggests tablespoonful doses of chloroform water every quarter of an hour as a useful expedient for the relief of pain. A combination of extract of belladonna and podophyllin, $\frac{1}{4}$ grain of each, in a pill has been highly lauded as a remedy for gall-stones, but we do not consider it merits the praise it has received.

Antipyrin has been suggested and given internally and hypodermically, but we cannot recommend it. We also prefer hot drinks and hot applications to iced drinks and the local application of ice, as has been suggested. Ringer states that in one case he has seen 5-drop doses of tincture of gelsemium "repeatedly avert an attack," but we do not see how it is possible to assert positively that anything has "averted" an attack! How can it be assumed with certainty that an attack would otherwise have supervened?

In cases of *protracted* pain with tenderness and enlargement of the liver, the free application of leeches over the right hypochondrium has been found to give relief. If the patient should become collapsed from the exhausting effect of the severe pain, ether, ammonia, and brandy must be given to revive him. Persistent vomiting may be best controlled by swallowing small fragments of ice. Purgatives should not be given during the paroxysms, but an enema of warm soap and water with a little turpentine is useful if there is tympanites; nor do we favour the use of emetics, from which, however, some practitioners have obtained advantage.

Olive oil in large doses has been stated by many authorities to be of great efficacy in relieving the paroxysms of biliary colic, as well as in preventing their recurrence. Willemin of Vichy* has, in particular, advocated its use for the relief of the paroxysms, and has published a number of cases in support of his contention. Rosenberg, of Berlin, has testified to the same effect. Willemin gives a glass of the pure oil (about 6 ounces) at one dose during the paroxysm, allowing the patient to take (or wash out the mouth with) a mouthful of brandy or some liqueur before and after taking the oil. He states he has never seen it vomited, but that, on the contrary, it allays existing nausea rapidly, as well as the pain. Others have given as much as 12 ounces of the oil at a dose. Rosenberg gives about 5 ounces, with which he mixes ½ an ounce of cognac, the yolks of two eggs, and a few grains of menthol. G. Sée treated ten cases of hepatic colic with olive oil, and in five the results were remarkable; there was immediate diminution of pain, and an almost immediate expulsion of many calculi.*

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* "Traitment des Coliques Hépatiques par l'Huile d'Olive." Paris: Steinhert. 1891.

The oil may also be given, according to Willemin, for the purpose of preventing an attack that seems imminent; in that case it should be given in the evening, as long after a meal as possible, and the dose should not exceed an ounce and a half. This dose should be given several days in succession. According to the observations made and collected by Willemin, the following conclusions may be drawn: (1) Olive oil given in full doses arrests almost immediately the severe pain of biliary colic; (2) it diminishes greatly the subsequent period of less severe suffering with depression, malaise, and jaundice that commonly follows a severe attack. In 15 out of 50 cases treated by olive oil biliary calculi have been found in the fæces. Strange to say, in all the cases treated by Dr. Willemin himself no search was made for calculi in the evacuations. The excuse he makes is of the feeblest. "I have not thought it necessary," he says, "to undertake a search which appeared to me difficult to carry out, and of doubtful utility!" Few, we imagine, will share this view. Fatty concretions, somewhat resembling gall-stones in appearance ("*pseudo-calculs biliaires*"), have been repeatedly noted in the stools passed after the administration of these large doses of olive oil, and it has been suggested that these have been sometimes mistaken for true calculi.

Various explanations have been offered of the beneficial action of large doses of olive oil in the treatment of gall-stones; it is not necessary to waste time on the suggestion that the oil ascends the bile ducts and exerts a solvent action on the biliary concretions;

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* *Médecine Moderne*, January 23rd, 1890.

that, we know, is impossible. The most generally-accepted view is that the oil acts as a cholagogue, and by the augmented flow of bile it produces, the stone is carried quickly along the excretory duct into the duodenum. But although this may afford a sufficient explanation of its action during the intervals, or before the occurrence of the paroxysm, or of its action in promoting the expulsion of calculi impacted in the ducts, it cannot explain how in the crises it is able to "arrest almost instantaneously the acute suffering."* It is scarcely possible that it can "instantaneously" produce a great flow of bile. If on further trials of this remedy in the crises of biliary colic it should be really found to have so immediate an effect in arresting the suffering, it might be possible that in these cases the calculus is entangled in and distending the narrow duodenal orifice of the duct, and that the contact of the oil (in large quantity) lubricates the orifice and so leads to the sudden expulsion of the calculus.†

In the cases already published of this treatment, where gall-stones have *not* been found in the evacuations (*i.e.* in 70 per cent. of the cases, according to Willemin !) we have to bear in mind the possibility of errors in diagnosis, as well as of the slipping back of the concretions into the gall-bladder; and in the cases in which gall-stones have been found in the fæces, after the administration of the oil, we have also to bear in mind the fact that it is in the nature of paroxysms of biliary colic to terminate suddenly and completely with the expulsion of the stone into the intestine, even without any treatment.

We may hope that in the further trials that will doubtless be given to this treatment in cases of gall-stone colic, a somewhat more detailed clinical investigation of all the circumstances in the entire course of the case, and especially a careful examination of the alvine evacuations, will be made. Osler states that olive oil has proved useless in his hands; and Mayo Robson says that he has tried it in a number of cases and never found it of the slightest service.*

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* Willemin, *op. cit.*

† Willemin suggests that it acts by reflexly allaying spasm of the biliary passages !

Quite recently Ferraud † has advocated the use of *glycerine* in the treatment of hepatic colic; he maintains that it is a powerful cholagogue, and in large doses, ½ ounce to 1 ounce, soon leads to the expulsion of the stone; and in small doses (1 to 3 drams, taken daily in a little alkaline water) it prevents fresh attacks.

Ralfe recommends 5-minim doses of spirit of turpentine during the paroxysm; he considers turpentine acts as a direct expulsive agent, by increasing the flow of bile, and by stimulating the muscular fibres of the gall-bladder and biliary ducts.

In considering the question of the treatment of gall-stones by olive oil we note that even its strongest advocates do not claim for it any efficacy in preventing the re-formation of concretions, or that it has any remedial influence over the "diathesis" on which the formation of these concretions is supposed to depend.

This brings us, *secondly*, to the consideration of the **treatment** of cases of gall-stones **in the intervals** between the attacks of biliary colic.

The first question which now arises is whether, when, after an attack of biliary colic, and the passage of one or more angular and facetted calculi by the bowel, we are convinced there remain other concretions in the gall-bladder, it is desirable to endeavour to promote their expulsion and discharge; or, when we reflect that biliary concretions in large numbers may and do exist in the gall-bladder without giving rise to any symptoms, may it not be wiser to allow them to remain there and not make any active attempt to disturb them? The answer must, we think, depend upon the course and character of each individual case.

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* "Gall-Stones and their Treatment.'

† *Semaine Méd.*, March 9th, 1892.

Manipulation of the gall-bladder with the object of expelling concretions lodged therein is of very doubtful expediency. Osler speaks strongly on this point; he says, "Expulsion of gall-stones from the bladder by digital manipulation, as recommended by George Harley, is a highly irrational procedure, not to be followed. So long as gall-stones remain in the bladder they do little or no harm in a great majority of cases. To force them on into the duct is to render the patient liable to severe colic or to the still more serious danger of permanent obstruction;" * and Mayo Robson also refers to this method as "futile" and "injurious." †

If, however, by increasing the flow, and diluting and diminishing the viscidity of the bile, or by altering its chemical characters, as by increasing its alkalinity, we can prevent the further deposition and formation of concretions, or promote the rapid discharge of numbers of small ones already accumulated in the gall-bladder, which periodically expose the patient to great suffering or to continued loss of health, it is certainly right and necessary to do so.

After the cessation of a paroxysm of biliary colic it is advisable to give some mild but efficient aperient and to continue to administer freely warm alkaline drinks; we shall thus promote the free secretion and outflow of watery bile, and minister to the discharge of such small or moderate-sized concretions as can pass easily through the excretory ducts. Numbers of calculi may often by such means be discharged and collected from the alvine evacuations.

The idea of giving medicines to dissolve the concretions in the gall-bladder—as, for instance, Durande's mixture of ether and turpentine—is only a survival of primitive medicine; and if the use of this mixture has ever been attended by any good result, it would probably be on account of its antispasmodic and stimulating properties. Ralfe is an

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* "Principles and Practice of Medicine," p. 438.

† "Gall-stones and their Treatment," p. 120.

advocate of its use. He thinks it exerts an antiseptic action on, and arrests decomposition of, bile ; and that it arrests the formation of "recurrent" gall-stones, "either by expelling precipitated cholesterin, mucus, and pigment before they have time to form in concretion ; or else by preventing precipitation by its action on the bile and biliary passages." It is needless to say that it is useless to give drugs with the idea that they can exercise any direct solvent influence on the concretions in the gall-bladder. They can only act on the contents of the gall-bladder, by causing modification of the biliary secretion.

Calomel, castor oil, podophyllin, euonymin, iridin, sodium salicylate, all have their advocates, as cholagogues* to be given to favour the removal of concretions from the gall-bladder. Perhaps as useful a means as any consists in giving half a grain of calomel with 4 grains of compound rhubarb pill every night at bed-time, and two drams of Carlsbad salts in a tumblerful of hot water early the next morning, and this latter dose may be repeated after an hour or two if free evacuation has not been produced ; or we may give two grains of euonymin or a quarter of a grain of resin of podophyllin, or, better still, four grains of iridin in place of the calomel. If we adopt the plan of giving an ounce and a half of olive oil every night, the addition to it of a dram of castor oil will greatly increase its activity.

While we are giving these cholagogue aperients, and so possibly causing a considerable loss of watery fluid by the bowels, we should, at the same time, insist on the consumption of considerable quantities of warm alkaline fluid by the mouth, so as to make the bile thinner and hasten its movements through the ducts. A tumblerful of Vichy or Vals water, warmed, or, what answers pretty nearly the same purpose, a tumblerful of hot water with twenty grains of sodium bicarbonate dissolved in it, should be drunk slowly three times a day—half an hour before lunch and dinner and at bed-time. Courses of mineral waters, such as Carlsbad, Marienbad, Vichy, Kissingen, Brides, and others, have justly acquired a great reputation in the treatment of gall-stones. They act as cholagogues, as purgatives, and as diluent alkaline fluids—and in resorts such as Carlsbad, where strict dietetic measures are also enforced, a very beneficial influence no doubt may be produced on the constitutional vice, upon which their formation depends.

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* Mayo Robson's observations on a case of biliary fistula serve to show that many supposed cholagogues diminish rather than increase the amount of bile excreted ; but this is probably due to their purgative action hurrying through the small intestines and out of the body substances out of which, when duly absorbed, *bile is formed.*

But it is by no means always essential that patients should be at the trouble and expense of travelling to these resorts, if they will be content to submit to the same orderly and strictly regulated life, and drink the imported waters, raised to a proper temperature, at home. We have obtained brilliant results in the application of courses of Carlsbad waters in cases of gall-stones, at home, when the patients have been willing to consent to adopt the strict regimen we have prescribed.

That the Carlsbad waters act in the manner we have suggested is admitted by those who have had the largest possible opportunities of watching their action. "The disappearance of stones," says Kraus, "is not due to their being dissolved . . their elimination is caused by the mechanical action of the waters . . by the thinner and normal condition of the bile during their use, by which the formation of fresh concretions is evidently prevented." * When, as often happens at Carlsbad, calculi of large size are eliminated, severe attacks of colic frequently occur, followed often by jaundice. This is one reason why it would be better for many patients, if they would submit to the regimen necessary, that they should take a course of Carlsbad at home. Naunyn has expressed

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* "Carlsbad, its Thermal Springs and Baths." London, Trübner.

a belief that hot Carlsbad water acts rather by stimulating the muscular coat of the gall-bladder than by its chemical action on the bile, and he states that he has found the injection of large quantities of warm water into the rectum act similarly.

The Vichy course is also of great value in the treatment of gall-stones, and leads to their elimination often with attacks of biliary colic, as at Carlsbad. But the Vichy water being in the main simply a solution of sodium bicarbonate, has little or no effect over the constipation from which such patients constantly suffer, and it is usual there to prescribe the occasional additional use of Rubinat water as an aperient.

The use of *sodium salicylate* as a cholagogue in cases of gall-stone has been warmly recommended by many physicians. It may be given in 15-grain doses four times a day with the same quantity of sodium bicarbonate dissolved in 4 ounces of warm water. Sodium sulpho-carbolate and sodium benzoate have also been employed.

The diet and mode of life of a patient who is the subject of gall-stones should be carefully regulated. If his or her mode of life is sedentary it should be altered, and a certain amount of active physical exercise insisted upon. Too many hours passed consecutively in the recumbent position should also be prevented, and six or seven hours only in bed might be supplemented by an hour or two of repose in the afternoon. If the patient, on the contrary, is of active habits, but accustomed to perspire very freely on exertion, we should insist on the excessive loss of water by the skin being more than compensated for by the free use of dilute alkaline drinks, such as Apollinaris, soda, or seltzer waters, or simple pure soft or distilled water (not water rich in lime salts). It is best that these be drunk warm, slowly, and when the stomach is empty, as at bed-time, or an hour or half an hour before meals. Mental labour should be restricted within moderate limits, and all causes of emotional excitement, when possible, avoided. Constipation should be guarded against. When the action of the skin is defective this should be stimulated by hot baths daily, or on alternate days, followed by cold sprinkling and friction with a rough towel, or by gentle massage.

Females should be cautioned against the dangers of tight-lacing, or of wearing tight bands round the waist.

The **diet** should be strictly moderate, and excess of food of any kind must be avoided. It has been assumed rather than demonstrated that an excessive consumption of fat favours the production of an excess of cholesterin, and so promotes the formation of biliary concretions, and an avoidance of animal fats is usually urged in these cases. This may be true of animal fats, but it certainly does not appear to be so with regard to vegetable fats, such as olive oil, as attacks of gall-stone are said to be rare amongst Italians, who consume olive oil freely.

Sugar and farinaceous foods should be taken only in very small quantities; bread should be eaten sparingly, and best in the form of dry toast. Animal food should be partaken of in great moderation, and the fat avoided. Eggs also should be avoided, or not more than one eaten daily. On the other hand, free use may be made of vegetables and fruit. Green fresh vegetables, salads, potatoes and ripe fruits are useful and suitable; the coarse, hard, and indigestible kinds must, of course, be avoided.

For a beverage, a little sound hock, still moselle, or Bordeaux wine, mixed with some alkaline table water, may be permitted.

Finally, it remains to be considered when **surgical interference** may be necessary in the treatment of gall-stones.

1st. A stone impacted in the cystic duct, although unattended by jaundice, may give rise to so much suffering, and may lead also to such great dropsical distension of the gall-bladder as to call for surgical operation; and the same will sometimes be the case with large calculi in the gall-bladder, as they not infrequently give rise to severe attacks of pain, possibly owing to fruitless attempts to pass out of it.

2nd. When gall-stones are impacted in the common duct, and give rise to intense and permanent jaundice, and all medical treatment fails to give relief, our only resource is surgical operation; the difficulty here, however, is one of diagnosis, for very similar symptoms may be caused by obstruction of the common duct from malignant disease, and such cases are very unsuitable for operation. Osler states that the existence of the following combination of symptoms is characteristic of obstruction of the common duct by gall-stones: (1) Jaundice of varying intensity, deepening after each attack of colic, and persisting for months, or even years; (2) Ague-like paroxysms, consisting of chill, fever, and sweating, followed usually by intensification of the jaundice; (3) At the time of the paroxysm pains in the region of the liver, with epigastric disturbances.

3rd. Empyema of the gall-bladder, or evidence of suppuration in its neighbourhood, would call for operation.

4th. Operation may be indicated when acute peritonitis arises as a complication in a case which has been previously recognised as one of gall-stone.

The following are the various operations which have been performed in connection with such cases:—

(1) *Sounding*, *i.e.* introducing a long fine needle, or a fine probe, through a cannula to sound for stones in the gall-bladder. This operation has proved fatal, and is generally rejected by surgeons, who prefer, if exploration is necessary, to make a small incision over the gall-bladder, so as to introduce the finger.

(2) *Aspiration*, by means of a fine perforated needle, in cases of distended gall-bladder. This operation, however, is not exempt from risk, and can rarely give more than temporary relief. Great care

must be taken by cleansing the surface to be punctured as well as the needle to be used, that asepsis is secured, and the gall-bladder should be completely emptied, and all tension removed.

(3) *Cholecystotomy*, or making an opening into the gall-bladder. This is the favourite operation for the removal of gall-stones, and has been performed many times by Mr. Lawson Tait, Mr. Knowsley Thornton, Mr. Mayo Robson, and many others.

The results have been very favourable, especially in cases without jaundice or with only slight jaundice, somewhat less so in cases with long existing jaundice, and very unfavourable in cases of malignant obstruction.

(4) *Cholelithotrity* may be combined with the preceding when calculi are found impacted in the cystic or common duct, and cannot be dislodged until they have been broken up. Sometimes a round needle is pushed through the wall of the duct into the concretion so as to break it up, or the calculus, when soft, may be compressed between the finger and thumb, or, when harder, it may be crushed by forceps, the blades of which are protected with rubber. The fragments are often allowed to pass away by the natural channels.

(5) *Cholecystectomy* or the removal of the gall-bladder ; this has been advocated as a better operation than cholecystotomy, as it avoids the risk of a biliary fistula which sometimes follows the latter, as it is easier to perform, and as the possession of a gall-bladder is not essential to health.*

(6) *Cholecystenterostomy*, an operation which has for its object the establishment of a fistula between the gall-bladder and the intestine, in cases of incurable biliary fistula, due to insuperable occlusion of the common bile duct and obstructive jaundice, from the same cause.

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* This subject is fully argued by Mr. Mayo Robson in his work on "Gall-stones and their Treatment," to which we must refer the reader for full particulars as to the details of all these operations.

ADDITIONAL FORMULÆ.

Durand's solvent for gall-stones.

℞ Ol. terebinth., 3 drams.
Æther. sulph., 2 drams.

M. Half a teaspoonful night and morning (in some vehicle).

Powder for gall-stones.

℞ Sodii benzoatis, 75 grains.
Sodii salicyl., 75 grains.
Pulv. nucis vom., 7 grains.

M. et divide in pulv. 20. One three times a day for two months.

Or,

℞ Sodii benzoatis, 1 dram.
Sodii salicyl., 1 dram.
Pulv. rhei, 1 dram.
Pulv. nucis vom., 5 grains.

M. et divide in pulv. 20. One at each meal. (*Huchard.*)

Turpentine emulsion for gall-stones.

℞ Ol. terebinthinæ, 5 minims.
Mist. acaciæ, ½ oz.
Sodii sulpho-carb., 20 grs.
Spir. chloroformi, 15 mins.
Aquæ menthæ pip. ad 1 oz.

M. f. haust. To be taken three times a day. (*Ralfe.*)

Glycerine in biliary colic.

Four to six drams to be taken during the attack.

One to three drams in alkaline water, daily, to prevent attacks. (*Ferraud.*)

Chloroform mixture for biliary colic.

℞ Chloroformi, 15 minims.
Tinct. myrrhæ, 15 minims.
Mucilaginis, 2 drams.
Syrupi ad 4 oz.

M. f. mist. A tablespoonful every fifteen minutes.
(*Lemoine.*)

Another.

℞ Chloroformi, ½ dram.
Ol. amygdal. dulc., 1 dram.
Syrupi aurantii, 1½ oz.

M. f. mist. A tablespoonful every quarter or half hour.
(*Tourasse.*)

Another.

℞ Chloroformi, 2½ drams.
Alcoholis diluti, 2½ oz.
Syrupi aurantii, 8 oz.

M. f. mist. A small wineglassful twice a day.
(*Bouchut.*)

Suppositories for biliary colic.

℞ Extr. belladonnæ, ⅓ grain.
Extr. opii, ⅓ grain.
Ol. theobromæ, 1½ dram.

M. f. suppos.
(*Dujardin-Beaumetz.*)

Rosenberg's olive oil mixture.

℞ Olive oil, 5 to 7 oz.
Brandy, ½ oz.
Menthol, ½ dram.
Yolks of 2 eggs.

M. f. mist. To be taken in three or four hours, two tablespoonfuls at a time.

Solvent for gall-stones.

℞ Chloroformi, ½ oz.
Ætheris sulph., ½ oz.
Ol. terebinth., 1 oz.
Sacchari albi, 2 drams.
Mucilaginis acaciæ, 2 oz.

M. A teaspoonful three times a day. (*Jackson.*)

Mixture for gall-stones.

℞ Acidi benzoici, 2 drams.
Liq. potassæ, ½ dram.
Aquæ destill., 6 oz.

M. f. mist. A tablespoonful three times a day. (*Harley.*)

As an aperient.

℞ Hydrarg. cum creta, 8 grs.
Pulv. rhei, 4 grains.
Magnesiæ, 20 grains.

M. f. pulv. (*Harley.*)

For hard symptoms.

℞ Ammonii chlor., 20 grains.
Pulv. antim., 3 grains.
Aquæ sambuci, ½ oz.
M. f. haust. (*Harley.*)

Chloride of ammonium in gall-stones.

℞ Ammonii chlor., ½ oz.
Extr. taraxaci, ½ oz.
Aquæ ad 6 oz.

M. f. mist. Two teaspoonfuls three times a day. (*Lewis Rogers.*)

CHAPTER II.

THE TREATMENT OF JAUNDICE.

Two forms of Jaundice—(1) *Jaundice from Obstruction*—Etiology: Gall-stones—Catarrhal causes—Stricture of Duct—Compression from Malignant and other Growths or Tumours—Mental Depression—Symptoms of Obstructive Jaundice—Discoloration of Skin and Urine—Itching of Skin—Loss of Appetite—Constipation—Pale Stools—Slow Pulse—Depression of Spirits, etc. —*Indications for Treatment in Catarrhal Cases*—Local Applications—Diet—Warm Alkaline Drinks—Aperients—Enemata of Cold Water, etc.—Emetics—Ipecacuanha—Nitrate of Silver—Quinine and Arsenic in Malarial Cases—Colchicum—External Treatment—Courses of Mineral Waters in Chronic Cases—Carlsbad, Vichy, etc.—Nitro-hydrochloric Acid—Diet in Chronic Cases—Intestinal Catarrh and Antiseptics—Treatment of the Cutaneous Irritation—Baths—Warm Drinks—Pilocarpine—Warm Clothing—Treatment of Cholæmia—Gymnastic Exercises—Diuretics—Tonics—Change—(2) *Non-obstructive Jaundice*—Etiology—Absence of Special Therapeutic Indications—*Jaundice of New-born Children.* Additional Formulæ.

WHEN, from any cause, the colouring matter of the bile fails to be normally eliminated and mixes with the general circulation, so that the patient's skin becomes stained *yellow* with bile pigment (*bilirubin*) he is said to have **jaundice.**

Jaundice, therefore, is but a *symptom* which may be dependent on a variety of morbid states, as we shall see; it has, however, been aptly said that "jaundice is a symptom with symptoms."

As a symptom jaundice often arises in the course of diseases which are wholly incurable and unamenable to any kind of remedial treatment.

Jaundice is often described as of two kinds; that is to say, as arising in two different ways. *First*, jaundice from *obstruction* to the outflow of bile along the biliary ducts, so that the bile is re-absorbed into the blood; and *secondly*, jaundice arising *without obstruction* and re-absorption, and supposed to be dependent on certain blood changes. These two forms are often spoken of as *Hepatogenous* and *Hæmatogenous* jaundice.

Much obscurity still rests on the mode of production of the latter form, and it would be out of place here to enter upon the many debateable points that have arisen in connection with this subject, more especially as they have no therapeutic significance.

The chief therapeutic interest in regard to jaundice is to be found in connection with the first class of cases—those of jaundice from **obstruction;** and it is to the causation, symptoms, and treatment of these cases that we shall first direct our attention.

A common cause of jaundice from obstruction is the presence of biliary concretions in the bile ducts. The presence of gall-stones in the ducts, however, is not always, or necessarily, attended with jaundice. A concretion in the cystic duct, although it may lead to retention of mucus secreted by the gall-bladder, and so cause distension of this organ and all the symptoms of gall-stone colic, does not cause jaundice, as it leaves the common duct free for the flow of bile into the intestine. So also an angular stone of comparatively small size, although it might be in the common duct and give rise to considerable suffering during its passage through it, yet might leave room for the bile to flow on into the intestine and there would be no jaundice. The treatment of this form of obstruction has already been fully considered in the preceding chapter on the treatment of gall-stones.

It is clear that jaundice from obstruction may occur either from an obstacle within the ducts blocking the bile channel, or from disease of their walls attended with tumefaction or constriction, or from pressure from without compressing and obliterating the channel.

An obstacle within the duct is most likely to be a gall-stone, although merely inspissated bile and hepatic sand or gravel, or a plug of mucus may temporarily obstruct the duct and cause jaundice.

The common duct has also been found obstructed by an intestinal worm.

It is generally believed that one of the most common causes of jaundice, especially of the milder forms of short duration, is an inflammatory catarrhal condition of the common duct, or perhaps more frequently a catarrhal swelling and obstruction of the duodenal opening of the common duct, arising in connection with an attack of catarrhal gastro-duodenitis. We speak of such attacks as attacks of catarrhal jaundice, and they may doubtless arise in connection with chill or with dyspeptic attacks from offending ingesta. Some physicians appear to think that we assume too much in referring most of these mild and brief forms of jaundice to catarrhal causes, and argue that this view is not supported by the occurrence of analogous catarrhal attacks in other strictly limited portions of mucous membrane. But we may point out in the first place, that the duodenum must, from its position, bear the brunt, as it were, of much of the irritation that arises from faulty gastric digestion or from the introduction of indigestible substances into the alimentary canal; the passage into the duodenum of excessively acid chyme may often provoke a temporary catarrh of that organ, and the reason temporary jaundice does not occur more frequently from this cause is no doubt due to the circumstance that the catarrh does not generally extend to the common duct or involve its orifice, at any rate to a degree sufficient to present an insurmountable obstacle to the flow of bile through it.

And in the second place we certainly *are* familiar with the circumstance that there is great individual peculiarity as to the sensitiveness of particular limited portions of mucous membrane to catarrhal changes, from *chill* or other irritants. In some the nasal mucous membrane, in others the laryngeal, in others the pharyngeal, in others the bronchial, although in actual continuity will commonly become catarrhal alone without any involvement of the others.

So also some persons after exposure to chill will at once show signs of a slight vesical catarrh, others of intestinal catarrh, and so on; so that there is abundant analogical support in favour of the view that these attacks of jaundice are catarrhal.

The common duct may also become obliterated by *stricture*, caused by the cicatrisation of an ulcer produced by the irritation of a gall-stone, or, in very rare instances, a polypus or other growth may arise within the duct and obstruct it; these and sundry other obstructive conditions can, it is clear, be only relieved by such surgical interferences as we have referred to in the last chapter.

There is also little to be done by way of medical treatment for these cases of obstructive jaundice that occur from compression of the bile ducts by malignant or other growths arising in their neighbourhood. Enlarged glands, tubercular or cancerous, in the fissure of the liver, or malignant or other growths connected with that organ, or with the pancreas, stomach, omentum, etc., or aneurisms of adjacent vessels, or fæcal accumulations in the colon, or a pregnant uterus may cause jaundice by pressure upon the excretory ducts. Many of these conditions are not amenable to medical treatment, and an accurate and certain diagnosis, without operative exploration, is often quite impossible.

A peculiar class of cases are those due to *mental shock* or depressing emotions, and they have been referred to the group of cases of obstructive jaundice because they are supposed to be due to "lowering of blood-pressure in the liver, so that the tension in the smaller bile ducts is greater than in the blood-vessels."

The jaundice that sometimes occurs, in greater or less degree, in association with active and passive hyperæmia of the liver, and in cirrhosis, needs no special consideration apart from these diseases. It is no doubt of obstructive origin.

It will be evident, then, that apart from those cases already dealt with in considering the treatment of gall-stones, it is chiefly catarrhal cases that can effectively be relieved by medical treatment.

The **symptoms** observed in **obstructive** jaundice are the following: 1. The most striking symptom, and the one from which the disease is named, is the *yellow discoloration* of the skin, which may vary from a pale yellow tint to an olive green, or even greenish black, according to the completeness or duration of the obstruction. It is in cases of permanent obstruction that these darker tints are encountered. 2. Distressing *itching* of the skin is a very common symptom in chronic cases; other forms of cutaneous irritation also often appear—lichen, urticaria, etc. 3. Some of the secretions, and especially the urine and the sweat, are coloured with bile pigment. This change is sometimes manifest in the urine before the skin is affected. 4. There is often nausea, entire loss of appetite, and consequent emaciation. 5. The motions lose their natural dark colour and become pale drab or clay-coloured, and they are often very fœtid, owing to the absence of bile from the intestinal canal. Usually there is constipation, and at other times, from the irritation of intestinal decompositions, there may be diarrhœa with flatulence. 6. Great slowing of the pulse has often been noted in jaundice (to 50, 30, or even 20 in the minute). 7. A proneness to hæmorrhage and to ecchymoses is a well-known feature in jaundice, especially in the severe forms. 8. Languor, sleepiness, melancholy, and great depression of spirits are notably present in these cases. Other features of *cholæmia* or bile intoxication, which may appear in aggravated and protracted cases, are convulsions, delirium, and even sudden and fatal coma.

The existence of more or less enlargement of the liver may often be made out in these cases.

Simple catarrhal cases are usually characterised by the absence of severe local pain and the somewhat rapid development of jaundice while in a condition of fairly sound health, and commonly after exposure to chill, or an attack of dyspepsia.

The *indications for* **treatment** in catarrhal jaundice are: 1st, to allay the catarrhal inflammation and swelling, and so remove the obstruction of the duct; 2nd, to further the removal of the obstacle by, if possible, promoting the flow of bile; and 3rd, to combat the symptoms due to the presence of bile in the blood and its absence from the intestine.

The first indication is best carried out by the local application of hot poultices of linseed meal and mustard; these are especially useful when there is some enlargement of the liver, with tenderness or uneasiness in the epigastric or right hypochondriac region. At the same time there should be a strict limitation of the diet to the simplest and plainest forms of food, and even these should be taken in small quantity. It should be remembered that the stomach and the duodenum are assumed to be in an inflamed and catarrhal condition, and that functional rest is of all measures the best for the removal of this state. The food then should, for a time, consist, if practicable, exclusively of warm milk and water, or, better still, of warm milk with an equal quantity of Vichy or Apollinaris water, or, what does equally well, of warm milk and water with 10 grains of sodium bicarbonate to each breakfast cupful. Those warm dilute alkaline drinks, which may be given almost *ad libitum*, are soothing to the irritated mucous membrane of the stomach and duodenum; they remove acidity, and they favour the secretion of thin and highly-fluid bile, while they also tend to dissolve any stringy or inspissated mucus they may come in contact with. If the patient will not be content with so rigorously abstemious a regimen, we may allow, in addition, some thin peptonised cocoa and milk, or peptonised gruel, made with finely-ground oatmeal, or some thin arrowroot, or we may permit, occasionally, a little consommé thickened with sago or tapioca. At the same time the patient should drink freely of warm

Vichy, Vals, or Apollinaris water, or a weak warm solution of sodium bicarbonate. The bowels should be kept freely relieved, and any tendency to engorgement of the portal vessels removed by mild un-irritating aperients, which will also favour the mechanical displacement of any plug of mucus which may possibly be obstructing the duodenal orifice of the bile duct. At the commencement of the treatment a small dose of calomel, half a grain or a grain, with 2 grains of extract of henbane at bed-time, followed the next morning by one or two teaspoonfuls of Carlsbad salts in a tumblerful of hot water, is perhaps as good an aperient as can be given. Afterwards, 2 grains of euonymin or 4 grains of iridin may take the place of the calomel, but the Carlsbad salts should be continued until the jaundice shows signs of abating, or until the obstruction has been removed, as would be evidenced by the reappearance of bile in the motions. It is needful to watch for any change in the appearance of the stools, as from these we derive the first intimation of the yielding of the obstruction. We do not approve of the use of strong "cholagogue" purgatives with the view of causing an increased secretion of bile, and so forcing on, as it were, the obstacle, for already the bile ducts are over-distended by retained bile, and we doubt if, in these circumstances, any attempt to exert a stimulating effect on the liver cells would be effectual. The real use of aperients is to carry off decomposing fæces, and so to relieve flatulent distension and prevent possible blood contamination, while by the intestinal commotions which they cause, especially when aided by gentle friction or manipulation of the abdominal surface, they mechanically promote the onward flow of the bile retained in the gall-bladder and bile ducts, and so tend to overcome the obstruction.

The injection of cold water (temperature, 60° F. gradually raised to 72°) into the rectum slowly by means of an irrigator, from 40 to 50 ounces at a time, according to the tolerance of the patient, and retained as long as possible and often repeated, has been advocated by Krull as a cure for catarrhal jaundice (and lauded by Dujardin-Beaumetz); we are, however, more in accord with Osler, who says, "this practice has been followed in my wards for several years, but I cannot speak warmly of the results." But if it should be found difficult to overcome the tendency to constipation by such aperient measures as we have indicated, we would give large enemata of warm water twice daily containing sodium sulphate and carbonate, $\frac{1}{2}$ ounce of the former and a dram of the latter to each pint. These should be given in the knee-elbow position or with the buttocks raised on a hard cushion, and retained for 10 or 15 minutes, or even longer. Some physicians recommend an emetic to be given at the onset of catarrhal jaundice—20 grains of powdered ipecacuanha in half a pint of hot water every half hour until vomiting is produced; by this means they believe sufficient pressure on the bile passages may be produced to dislodge a plug of mucus or other obstacle in the biliary canal.

In place of warm solutions of sodium bicarbonate, which, as we have said, we think the best remedy, others use sodium phosphate, benzoate, or salicylate, or ammonium chloride. Any of these may be employed, but we do not believe they will be found more efficacious than sodium bicarbonate. If the jaundice does not quickly disappear or diminish in intensity, other remedies may be applied. Small doses of ipecacuanha, $\frac{1}{4}$ of a grain to a grain thrice daily, may be given as a hepatic stimulant. On the supposition that the duodenal mucous membrane is in a state of chronic catarrh, nitrate of silver has been advised in pill given on an empty stomach. If there should be reason to regard the attack as possibly of malarial origin, it may be necessary to administer quinine or arsenic; or if there be a presumption in favour of a gouty irritation of the bile ducts, colchicum, in combination with alkalies, will be likely to give relief.

We may here mention Gerhardt's method of treating obstructive jaundice, which consists in passing a faradic current through the gall-bladder, one pole of the battery being placed on the spine, and the other over the distended gall-bladder—the object being to produce a general contraction of the muscular fibres of that organ. He has seen the gall-bladder diminish greatly in size, and a bilious evacuation follow two such applications.

When the disease tends to become **chronic,** and we are able to eliminate all other possible causes than a chronic catarrhal condition of the bile ducts, we may have to consider other methods of treatment.

In such cases, just as in cases of jaundice from gall-stones, mineral-water treatment, at such spas as Carlsbad, Vichy, etc., often proves most serviceable. The movement of travel, the regular exercise in the open air, the regular bathing, the strictly-prescribed dietary, combine to promote the remedial effects of the warm, saline, alkaline waters. When aperient action is required, Carlsbad or Marienbad is the more suitable, and Vichy is better when no such aperient action is needed. The diluent effect of large draughts of warm alkaline water is, as we have previously pointed out, an obvious remedial agency in these cases. A favourite remedy in some of these cases, especially in Anglo-Indians, is dilute nitro-hydrochloric acid, both internally and externally. Twenty minims of the dilute acid in 1½ ounce of infusion of calumba may be given three times a day, an hour before meals. For topical use, 3 ounces of nitro-hydrochloric acid should be added to a gallon of water of a temperature of 98° F.; this may be used as a foot bath, and the legs, arms and abdomen may be sponged with it; or it may be applied to the hepatic and abdominal region by means of a broad flannel roller, soaked and wrung out in the acid. Two thicknesses of this should be wound round the abdomen, and then covered with oil-silk. It should be worn regularly under the dress and changed morning and evening. Dr. Musser appears to think the prolonged use of nitrate of silver, combined with extract of belladonna ($\frac{1}{8}$ to $\frac{1}{4}$ grain), before meals, of very great value in these chronic cases.*

The absence of bile from the intestine has usually been regarded as giving rise to symptoms calling for treatment, such as constipation, putrefactive changes and acidity of the intestinal contents, causing distressing flatulence, together with imperfect assimilation of fatty matters. But Mayo Robson concludes from the elaborate study of a case of biliary fistula, in which no bile entered the alimentary canal, that an entire absence of bile from the intestine is quite compatible with good health; that its supposed stimulating aperient effect is not needed, that its *antiseptic* properties are unimportant, and that, although it assists in the absorption of fat, it is not absolutely necessary for that purpose, and that bile, in short, is chiefly excrementitious.† These conclusions are, perhaps, a little too absolute to be based on one observation, for the opposite conclusions, that the absence of bile from the bowel does lead frequently, directly or indirectly, to constipation, to putrefactive decomposition and flatulence, and to disordered digestion and assimilation, are founded on a vast number of observations by a variety of skilled observers.

Certainly, in the practical management of cases of jaundice, we shall have to consider these possibilities. It is desirable, therefore, in these chronic cases, to give simple kinds of food that can be readily assimilated, and that will not leave much residue to undergo putrefactive changes. Milk and light farinaceous foods, with small quantities of the more delicate kinds of fish and chicken are permissible; but all excess must be carefully avoided, and fatty and saccharine foods prohibited. We have already pointed out the importance of the free exhibition of alkaline beverages, when the stomach is empty. To correct intestinal acidity, it is best to give an insoluble alkaline carbonate, such as magnesia, once or twice daily—half a teaspoonful of light magnesia may be given at bed-time every night in a wineglassful of warm water.

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* Hare's "System of Practical Therapeutics," vol. ii. p. 834.

† "Gall-stones and their Treatment."

That the absence of bile from the intestine does, in many cases, lead to morbid putrefactive changes in its contents we are satisfied, and we are also disposed to agree with Dujardin-Beaumetz, that the symptoms referrible to the nervous system which appear in cases of protracted jaundice are due, in some degree, to the absorption of poisonous ptomaines from the alimentary canal. In order to avoid these changes, various remedies are available, and their employment will usually be found to be attended with great benefit to the patient. A capsule, containing a minim of creasote, or a grain of thymol made into a pill with a little powdered soap and rectified spirit, may be taken after each meal; either of these will be found most valuable in checking the intestinal putrefaction. Bouchard recommends charcoal upon which an ethereal solution of iodoform has been poured. The ether evaporates rapidly, and a mixture of charcoal and iodoform remains; this is an exceedingly disagreeable remedy, which we do not consider more efficacious than the preceding. He has also suggested naphthaline and naphthol. Dujardin-Beaumetz extols "sulpho-carbonated water"—water saturated with sulphide of carbon and flavoured with peppermint water—he gives 5 or 6 tablespoonfuls of this daily, mixing each spoonful with half a glass of milk. By this means he succeeds in rapidly removing the fœtor of the motions. Inspissated ox-gall (*fel bovinum purificatum*) has been given with advantage in these cases to supply artificially the aperient, digestive, and antiputrefactive properties of the absent bile. But to be of use it must be *quite fresh*, and 10 grains of this may be given an hour or two after food three times a day, and it is best to coat these pills with a coating (such as keratin) soluble in the duodenum, but not in the acid contents of the stomach.

Creasote will be found a useful remedy also when diarrhœa is excited by the acid or putrefying intestinal contents. Whitla recommends large doses of turpentine in capsules for the relief of this symptom, taken when the stomach is empty, so that it may pass through into the intestine and exert its antiseptic action there. Salicylate of bismuth, charcoal, and boric acid, have all been found useful for the same purpose.

We have already insisted on the necessity of administering aperients regularly in all forms of jaundice associated with constipation. It must, however, be borne in mind, that in *chronic* jaundice from obstruction there is no indication for so-called hepatic stimulants or *cholagogues*, but rather for such saline or other aperients as will unload the portal circulation, relieve any hepatic engorgement, and remove the pressure on the distended bile ducts. An aloetic and soap pill at night, and a draught containing sodium or magnesium sulphate the following morning, will be found one of the best aperients to use in these cases.

In the next place there are certain symptoms dependent on the presence of bile *in the blood*, which require to be considered; one of the most troublesome is an intense **itching** of the skin. Warm baths or vapour baths, together with friction of the skin while in the baths with alkaline (sodium) soaps, is one of the best means of relieving this symptom. Sponging with weak carbolic lotion has been found useful. Warm diaphoretic drinks, together with vapour baths, so as to promote free excretion from the skin, should be given. *Pilocarpine* has been advocated as a most efficient remedy for this symptom, given hypodermically, in doses varying from $\frac{1}{12}$ to $\frac{1}{6}$ of a grain; indeed, Witkowski, whose statement is quoted, and in part approved by Professor Whitla, has maintained that this is *the* remedy for all cases of simple hepatogenous jaundice. He injects $\frac{1}{6}$th of a grain once or twice daily. It is hardly necessary to point out that chill of the skin should be carefully guarded against by wearing thoroughly warm clothing.

Other symptoms dependent on the presence of the colouring matter of the bile in the blood are depression of the circulation, as indicated by slowing of the pulse rate, and a tendency to hæmorrhages, as well as great depression also of the intellectual functions, with drowsiness and hypochondriasis. To relieve these we must promote the natural efforts at elimination, mainly carried on by the kidneys, but which may be aided by stimulating the respiratory functions. Frerichs insisted on the importance of increasing or maintaining the activity of the respiratory functions for the purpose of promoting the oxidation and destruction of the bile pigment, and for this purpose, when the patient is able to do so, we should encourage him to take much exercise in the open air, and to combine with this such gymnastic exercises as are within his strength and competence. It is our business also to favour the eliminative action of the kidneys. One of the best diuretics for this purpose is an abundance of pure water, or milk largely diluted with warm water, or whey may be advantageously used if milk shows any signs of disagreeing. Vichy, Ems, or Apollinaris water may be largely given, mixed with warm milk or whey. Potassium iodide, combined with potassium bicarbonate, 5 to 10 grains of each in a wineglassful of warm milk and water, may be given as a diuretic thrice a day. Imperial drink—effervescing lemonade, made with lemon-juice and potassium bicarbonate—may be freely given.

Great circulatory and mental depression may require the use of tonics and stimulants. Digitalis has been suggested, but its administration is rarely appropriate. Quinine and strychnine, combined with ammonia or with nitro-hydrochloric acid, according to circumstances, will be found the best tonics. The light effervescing wines (champagne, hock, moselle) often act freely as diuretics when diluted with a little alkaline water, and may be found useful in raising the forces of the patient when they are greatly depressed. Travel and the distractions it affords have been thought useful in warding off the mental and physical depression so distressing in protracted cases.

In cases of obstructive jaundice from organic stricture of the duct, or from pressure on it by malignant or other tumours, the remedies mentioned here can, obviously, only be palliative in their effects. In some of these cases surgical operation may be of use, as we have pointed out, when dealing with the treatment of obstruction from impacted calculus.

We, in the next place, come to the consideration of those forms of jaundice which are **not due to obstruction.** It is in these cases especially that jaundice must be regarded as symptomatic and as presenting no particular claim, of itself, to therapeutic effort. It is frequently only one out of many morbid phenomena presented by the disease in which it appears. The obscurity and uncertainty which surround its mode of origin render it futile to seek for causal indications for treatment. Jaundice is the prominent symptom in the rare disease known as *acute yellow atrophy* of the liver, which is characterised anatomically by extensive necrosis of the liver cells. This disease is almost invariably fatal, and for that reason it is also named "malignant jaundice." Its mode of origin is unknown, and no remedies that we know of are capable of influencing its course. Jaundice is also a symptom in many forms of *toxhæmia*, as in yellow fever, in malarial conditions, in some cases of typhoid, remittent and relapsing fevers, in some forms of pneumonia, in pyæmia, in cases of snake-bite, in phosphorus, and sometimes in ether and chloroform poisoning. The jaundice in these cases is now believed to be due to increased destruction of red blood corpuscles; the blood pigment set free in large quantities (hæmoglobin) is transformed into *bilirubin*, and as this cannot be eliminated by the liver, kidneys, etc., as fast as it is formed, it is deposited in the tissues. Except in acute yellow atrophy the skin in these cases is rarely so darkly stained as in obstructive jaundice; moreover the stools are not pale or clay-coloured, they may even be very dark; and the urine, in many of these cases, may contain but little bile pigment, although the urinary pigments are often greatly increased.

There is no special treatment that can be directed to the symptom of jaundice alone in these forms.

There is also a *jaundice of new-born children*—not the mere yellow discoloration of the skin often observed for a few days after birth, and dependent on the intense congestion of the skin during the first few hours of life—but a true jaundice, with staining of the conjunctivæ and skin with bile pigment, attended by the passage of bile-stained urine. There is a *benign* form which is very common, and will often get well without any treatment. The most that is necessary to hasten the disappearance of the jaundice is a mild aperient with a little sodium bicarbonate; $\frac{1}{20}$th of a grain of calomel or $\frac{1}{2}$ a grain of grey powder, with 2 or 3 grains of sodium bicarbonate, may be given twice or thrice daily. There is also a *grave* form, which is rare and may be due to congenital obliteration of the gall-ducts or to septic infection through the umbilicus (umbilical phlebitis). The poison may be derived from the maternal passages. These cases are almost invariably fatal; the proper treatment is that which would be applicable to other septic states.

ADDITIONAL FORMULÆ.

Pills to promote flow of bile in catarrhal jaundice.

℞ Extr. aloes, 30 grains.
Sodii bicarb., 60 grains.
Extr. taraxaci, q.s.

Ut f. pil. 60. (To be kept in lycopodium powder.) Two night and morning.

(*Bamberger.*)

Or,

℞ Extr. aloes aquosi, 60 grs.
Extr. rhei comp., 30 grains.
Extr. taraxaci, q.s.

Ut f. pil. 60. Three pills night and morning.

(*Bamberger.*)

Powder in jaundice.

℞ Sodii bicarb., 1½ oz.
Pulv. rhei, 2 drams.
Pulv. zingib., 4 drams.
Pulv. calumbæ, 6 drams.
Pulv. ipecacuanhæ comp., 1 dram.

M. f. pulv. A small teaspoonful in half a tumblerful of potash water to be taken every four or six hours. (*Whitla.*)

Mixture in jaundice.

℞ Succi taraxaci, 2 oz.
Sodii bicarb., 6 drams.
Tinct. rhei, 1½ oz.
Infus. gentianæ ad 12 oz.

M. f. mist. A tablespoonful three times a day. (*Whitla.*)

Pills in catarrhal jaundice.

℞ Fel bovini purificati, 1 dr.
Manganesii sulphatis exsic., 40 grains.
Resinæ podophylli, 5 grains.

M. et divide in pil. 20. One three times a day. (*Bartholow.*)

For the pyæmic jaundice of the new-born.

℞ Quininæ sulph., 1½ to 3 grs.
Acid. sulphurici dil., 3 mins.
Syrup. aurantii, 2½ drams.
Aquæ destill. ad 2½ oz.

M. f. mist. A teaspoonful every two hours. (*Widerhofer.*)

For acute catarrhal jaundice.

℞ Liq. ammonii acetatis, 5 oz.
Spirit. ætheris nitrosi, 1 oz.
Tinct. rad. aconiti, 24 mins.

M. A tablespoonful every three hours in half a tumblerful of lemonade or Apollinaris. (*Engel.*)

Pills in malarial jaundice.

℞ Quininæ sulphatis, 40 grs.
Ferri sulphatis exsic., 20 grs.
Acidi arseniosi, 1 grain.

M. et divide in pil. 20. One three times a day. (*Bartholow.*)

Aperient pills in jaundice.

℞ Aloes socotrinæ, 15 grains.
Gambogiæ, 15 grains.
Hydrarg. subchloridi, 15 grs.
Syrupi, q.s.

M. et divide in pil. 10. One or two a week to keep the bowels loose. (*Gubler.*)

CHAPTER III.

THE TREATMENT OF CONGESTIVE AND INFLAMMATORY AFFECTIONS OF THE LIVER. 1. HYPERÆMIC CONDITIONS. 2. ACUTE SUPPURATIVE HEPATITIS, ABSCESS OF LIVER. 3. CHRONIC INTESTINAL HEPATITIS, CIRRHOSIS.

1. *Hyperæmic Conditions of the Liver.*—Causes of Active Congestion—"Free Living"—"Liver-chills"—Malaria—Gout—Suppression of Habitual Discharges—Symptoms—Indications for Treatment—Diet and regimen—Counter-irritation—Aperients—Alkaline Effervescents. Treatment of Chronic Cases—Value of Courses of Mineral Waters and Hydrotherapy—Passive Congestion—Causes—Treatment.
2. *Acute Suppurative Hepatitis. Abscess of Liver*—Causes of Multiple Abscesses—No special Therapeutic Indications—Tropical Hepatic Abscess—Etiology—Symptoms—Pyrexia—Pain—Swelling—Fluctuation—Characteristic Aspect—Results—Treatment—Ipecacuanha, Morphine, etc.—Preliminary Puncture and Aspiration—Free Incision and Drainage—Modes of Procedure.
3. *Chronic Interstitial Hepatitis. Cirrhosis*—Its Nature—Causes—Alcohol, etc.—Varieties—Hypertrophic or Biliary Cirrhosis—Symptoms of ordinary Atrophic Cirrhosis—Gastro-Intestinal Catarrh—Hæmatemesis—Ascites—Slight Jaundice—Hæmorrhoids—Toxic Symptoms—Indications for Treatment—Diet—Milk—Aperients—Courses of Mineral Waters—Alkalies—Intestinal Antiseptics—Nitro-hydrochloric Acid—Treatment of Hæmatemesis and Ascites—Propriety of Tapping—Mode of Operation—Diuretics and Purgatives—Potassium Iodide—Ammonium Chloride—Tonics—Treatment of Varieties. Additional Formulæ.

1. Hyperæmic Conditions of the Liver.

Congestion of the liver is a term of very frequent use, but its signification is not always very definite and precise. It doubtless is often assumed to exist when it does not, and it is offered as an explanation of certain vague dyspeptic and other symptoms, without any positive evidence, from physical examination, of the existence of a morbid state of the liver.

It would, however, be a serious error to ignore the frequent existence of temporary as well as chronic morbid congestions of the liver, simply because this term is so vaguely, and often inaccurately, employed.

Hyperæmic conditions of the liver may be either (*a*) *active* or *fluxionary*, or (*b*) *passive* or *congestive*; and we commonly speak of these states as *active* or *passive* congestion.

The amount of blood in the liver varies considerably within physiological limits, and there is a transient congestion of this organ after each meal. Rapid absorption by the portal vessels raises the lateral pressure in the portal venous system and causes a *fluxion* to the liver. Habitual excessive indulgence in food and drink may, and doubtless does, intensify this fluxion and produces active hyperæmia or congestion of the liver which, in course of time, leads to functional disturbances of this organ. The excessive consumption of alcohol, especially in the form of ardent spirits, is well known to lead to serious organic changes in the liver, as we shall presently see; but short of these serious organic changes, the habitual free use of alcoholic stimulants, together with a liberal consumption of food, is especially prone to induce such conditions of active congestion of the liver as we are now considering. One of the effects of the alcohol conveyed to the liver by the portal veins is no doubt to cause dilatation of its capillaries, and so to contribute directly to hyperæmia of this organ. Frequently recurring hyperæmias will naturally lead, in course of time, to permanent dilatation of the vessels.

Occasional over-indulgence in food and drink may lead to temporary congestion of the liver, of no great consequence, but habitual over-indulgence may lead to more permanent hyperæmia, which may require more serious consideration. It is clear that what is called "free living" tends to maintain active hepatic congestion.

It has been the custom of late years to speak of **"liver-chill,"** a condition which we should be disposed to place under the head of active febrile congestion of the liver, and which would appear to be capable of being produced by exposure to chill in certain other favouring circumstances, one of the chief of which would seem to be over-work and anxiety, and perhaps the possession of what is called a gouty constitution. In such circumstances, in certain constitutions, evidences of hepatic engorgement occur, with some enlargement and tenderness of that organ; this is usually accompanied by a moderate rise of temperature, and is often associated with symptoms of gastro-intestinal catarrh, and not rarely with incipient jaundice, viz. bile-tinted conjunctivæ, pale motions and high-coloured urine, headache, languor, and physical and mental prostration.

We must add, then, exposure to cold in certain circumstances, to the causes of active hepatic congestion.

It is possible that the chronic hyperæmic conditions of the liver, which arise so commonly in Europeans who have to reside in tropical countries, may be closely allied to those states of "liver-chill" which occur in Great Britain, and may be, in part, dependent on chill supervening after exposure to great heat. But it is usual to regard these morbid states of the liver, arising in tropical countries, as dependent on exposure to malarial influences.

Certain constitutional states, as the gouty and rheumatic, but especially the former, are generally admitted to predispose to attacks of active congestion of the liver. Prof. Bouchard has stated that he has observed dilatation of the stomach to be always accompanied by congestion of the liver, which he regards as produced by the passage into the portal veins of toxic substances derived from the abnormal decomposition of the contents of the dilated stomach. Active congestion of the liver has also been observed to follow the suppression of the menstrual flow or that of a hæmorrhoidal flux.

The **symptoms** of active congestion of the liver are sometimes those which we have mentioned under "liver-chill," but in other instances, and especially in the chronic forms, they usually consist of a sense of fulness or weight or constriction in the hepatic region, with pain or tenderness over the liver, where it escapes from the protection of the ribs, as will be found by percussion and palpation. There is also pain under the right shoulder, and often there are present the symptoms of chronic gastric catarrh, such as pain and fulness after food, flatulent distension, loss of appetite, a coated tongue, constipation (sometimes slight diarrhœa), high-coloured urine depositing lithates, headache, lowness of spirits and general malaise.

The **indications for treatment** in most cases of active hyperæmia of the liver are tolerably clear, and when thoroughly and honestly carried out, prove highly remedial.

The first and most important is to correct all errors of **diet** and faulty habits of life. The over-fed, indolent person must be made to take less food and more exercise. Those prone to indulge in alcoholic stimulants must be induced to forego this indulgence, and to be content with other beverages. When over-work and too close application to business or public affairs are at the root of the evil, rest and change must be insisted upon. Courses of mineral waters at Continental spas are, as we shall presently see, most useful in many of these cases, and they are not only useful in themselves, but they are also of great value from the necessity they involve of change and rest from habitual occupations. In the *febrile* cases, the cases of "liver-chill," the indication is to relieve the hepatic engorgement and the gastric catarrh usually associated therewith by a few days' *rest* in bed, by light, unirritating food, by counter-irritation, and by unirritating aperients and alkalies.

Counter-irritation over the region of the liver is undoubtedly of great value—the application of leeches, advised by some, we do not consider called for except in very exceptional cases—a large hot linseed and mustard poultice all over the right hypochondrium and the epigastric region will often be found of great service to the patient, and, when removed, should be succeeded by a thick layer of warm cotton wool. The food should consist at first almost exclusively of fluids—milk and Apollinaris water, thin gruel, water arrowroot, light mutton or veal broth, a little light clear soup, weak tea with milk, and, after the feverish symptoms have passed away, some boiled fish (sole or whiting), and chicken and rice, or white game, or similar light food may be prescribed.

The hepatic congestion will certainly be favourably affected by draining, as it were, fluid from the portal vessels by means of suitable aperients, which will also at the same time unload the bile channels; for this purpose we should give a small dose of calomel, ½ a grain or a grain, at night (euonymin or iridin may be preferred for some persons), and a saline aperient draught the following morning—1 to 2 drams of sodium sulphate or magnesium sulphate, with 20 grains of sodium bicarbonate, in 2 ounces of warm water; or, with delicate persons who require a very mild and pleasant aperient, we may order 3 ounces of Dinneford's fluid magnesia, with a teaspoonful of lemon juice. During the day, an hour or half an hour before each meal, an effervescing saline dose, with a considerable excess of alkali, will be grateful and most useful to the patient. It relieves the tendency to nausea, allays thirst and "heat of stomach," and promotes the flow of thin bile into the intestine. The following is a good form :—

℞ Sodii bicarbonatis		3 drams.
Ammonii carbonatis		30 grains
Aquæ	ad	6 oz.

M. f. mist. alkalina.

℞ Acid. citrici		1 dram.
Syrupi limonis		6 drams.
Aquæ	ad	6 oz.

M. f. mist. acida. Two tablespoonfuls of each mixture to be mixed together and drunk while effervescing, an hour before each meal.

If the hepatic congestion is associated with suppression of the menstrual flow, leeches to the os uteri and the application of cupping glasses or mustard poultice to the inside of the thighs have been advocated; and if dependent on the arrest of a hæmorrhoidal flux, leeches may be applied to the anus; but cases of this kind are rarely encountered.

For the **chronic** cases a different plan of treatment will be required. Instead of rest, free exercise in the open air, when possible, should be almost invariably urged. A careful, spare dietary should be insisted upon. Counter-irritation over the hepatic region may still be useful. The "chillie paste," used largely at Smedley's, at Matlock, is useful for this kind of continued counter-irritation.

Regular and free action of the bowels by means of aperients will usually be necessary and beneficial. A euonymin (2 grains), aloes (1½ grain), and ipecacuanha (½ grain) pill at night, followed by one or two teaspoonfuls of Carlsbad or Homburg salts, in half a glass of hot water, the following morning, will be found efficacious in most cases.

But it is in these cases of chronic congestion of the liver that Spa treatment proves so useful. A considerable choice may be afforded and a selection made according to individual peculiarities or needs. Carlsbad, Marienbad, Kissingen, Tarasp, Brides, Vichy, Harrogate, Leamington, may prove efficacious in suitable cases.

Hydrotherapeutic treatment has also proved of great service, especially in malarial cases and in cases dependent on excesses in food or drink.

Dujardin-Beaumetz * insists that this method would be found far more efficacious if it were rightly applied, and the following is the mode he prescribes. A cold douche should be applied over the liver—the patient standing with the right arm raised and the right thigh half-flexed—so as to receive the cold jet directly over the whole of the hepatic region. The douche should be of very short duration; 15 seconds will generally be enough, and it should never last longer than 30 seconds. Beni-Barde recommends the Scotch or alternating douche, hot and cold alternately, for the space of a minute. In some excitable, nervous persons a spinal douche of considerable volume, but of feeble pressure, answers best.

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* "Clinique Thérapeutique," "Traitement des Engorgements du Foie." Vol. ii. p. 119.

Passive hyperæmia or **congestion** of the liver is a common consequence of all those morbid states of the heart or lungs, or other intrathoracic disease, which lead to stasis of blood in the right side of the heart; and, owing to the very feeble lateral blood-pressure in the hepatic veins, only a slight obstruction is necessary in order to lead to more or less passive engorgement of the liver. Congestion of the liver is a usual consequence, and a regular feature in the clinical course of chronic valvular cardiac disease, of advanced emphysema, of pulmonary fibrosis, and of any condition of the lungs or the thoracic contents which interferes with the free outflow of blood from the right side of the heart. The term "cardiac liver" is one in common use to express that state of chronic passive hyperæmia of the liver, and the structural changes it leads to, as a consequence of cardiac disease; and the familiar term "nutmeg liver" is applied to the appearances presented on sections of such a liver *post mortem.*

The liver may enlarge very considerably from hyperæmia of this kind, and the liver dulness may reach to the umbilicus or even below it. It is in circumstances such as these that "hepatic pulsation" may sometimes be detected, the whole organ throbbing at each cardiac contraction with the backward flow of blood into the hepatic veins.

We have already called attention to the symptoms attending this condition, and the treatment indicated, when dealing with the subject of chronic mitral valve disease, of which it forms a part:—the gastro-intestinal catarrh, the occasional hæmatemesis, the occurrence of ascites and general dropsy, the slight jaundice, the pale motions, and the high-coloured scanty urine containing biliary pigment.

In remediable cases, cardiac tonics, such as digitalis, together with rest in bed, may remove the hepatic engorgement by remedying the cause on which it depends. The value of free purgation we have repeatedly insisted upon to relieve the congestion of the abdominal veins. The food must be nourishing but light, and pre-digested or very digestible, and small in quantity.

In cases of intense hyperæmia it has been suggested that the liver should be punctured, and 18 or 20 ounces of blood withdrawn by aspiration. No doubt this measure might reduce, temporarily, the size of the liver, but in most of the conditions which lead to hepatic congestion of this extent the loss of blood is badly borne, and the benefit derived would be only of very brief duration.

2. ACUTE SUPPURATIVE HEPATITIS. ABSCESS OF LIVER.

Suppurative inflammation of the liver is met with in two forms: (1) *Septic* and *pyæmic* abscesses, and (2) the *large solitary* and *tropical abscess*.

The first form is almost invariably multiple except in some traumatic cases, when a large solitary abscess may sometimes be met with; they are always the result of septic, microbic, infective inflammation. They are prone to occur in cases of general pyæmia, and especially in conditions of *portal* pyæmia, when suppurative disease occurs in the region of the portal vessels, as in dysentery, typhlitis, appendicitis, ulcerative colitis, anal fistula, gastric ulcer, etc.

Multiple hepatic abscesses may also occur in connection with suppuration of the bile ducts from impacted calculus. When multiple infective abscesses are found, as they often are, within the branches of the portal vein, this condition is known as *suppurative pylephlebitis.* In these cases there is uniform enlargement of the liver, which is tender on pressure; there is pyrexia, which runs an irregular course, as in pyæmic jaundice; the complexion is muddy, and often bile-tinted. There are no clinical distinctions between pyæmic abscesses and suppurative pylephlebitis, their symptoms and features are those of pyæmia, with the addition of an enlarged and painful liver and a sub-icteroid hue of the skin. There is *no special treatment* of this state apart from that of the general or local infective disease from which it arises. Surgical interference is useless, as these cases invariably end fatally, but there could be no objection to puncturing an abscess which pointed externally.

Having dismissed these cases of multiple septic hepatic abscesses, we will now consider the more interesting subject, from a therapeutic point of view, of the treatment of the large "solitary" tropical hepatic abscess. Tropical abscesses are not, however, always solitary, although they frequently are so; nor are solitary large abscesses of the liver (so-called *primary* hepatic abscess) confined exclusively to tropical countries. They are very common, no doubt, in hot climates, but they do occur, though rarely, in England and other regions outside the tropics, but in temperate climates abscess of the liver is invariably *secondary.*

It has been debated whether abscess of the liver, even when it occurs in tropical countries, is ever really "*primary,*" whether, in short, it is not always due to secondary infection from dysenteric ulceration, or some other infective condition in the intestinal canal. That it very frequently follows or is associated with dysentery is universally admitted. Many medical men, however, who have had extensive experience in India, believe that abscess of the liver may develop "*idiopathically,*" and it seems to be agreed that cases certainly do occur without a history of previous dysentery, and that fatal cases have been met with where there has been no discoverable affection of the large intestine.

In the interesting researches on amœbic dysentery of Councilman and Lafleur,* it is suggested that the *amœbæ coli* (which they consider to have been proved to be the causative and characteristic organism of tropical dysentery) are carried to the liver by the portal vein and there produce dysenteric abscesses. "Of themselves the amœbæ can only produce a certain amount of injury by tearing the capillaries, the agents which produce the abscesses being the bacteria which are carried within the bodies of the amœbæ from the intestinal canal to the liver."

These amœbæ have been found in abundance in the stools of dysenteric patients, also in the dysenteric ulcers, and abundantly in the pus of hepatic abscesses, and in the sputum in those cases where a hepatic abscess has opened into the lung. These observers examined the pus in four liver abscesses in cases where there was *no* dysentery, and they did not find any amœbæ. Three of the cases recovered after operation, and in the fourth, fatal case, an ulcer was found in the rectum. "Whether," they add, "the three patients who recovered were suffering from latent dysentery or not must remain a matter of conjecture."

In these reported cases of tropical hepatic abscess *without* intestinal lesions, no search being made for amœbæ, it is impossible to say whether they were present or not. "If they all are produced by the amœbæ, it is possible that they enter the liver without producing any intestinal lesions." † Further researches are needed and will doubtless be made in this direction, and for the present we are disposed to conclude, as Fagge does, that "if previous dysenteric ulceration be rejected as a cause of hepatic abscess, no other can be assigned."

Cases of hepatic abscess, as observed in Great Britain, usually occur in persons who have returned from a residence in the tropics, or who have contracted dysentery in India; instances are, however, on record of typical dysenteric abscess in patients who have never been out of England.

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* "The Johns Hopkins Hospital Reports." Baltimore. Vol. ii. Nos. 7, 8, 9.

† Councilman and Lafleur.

The **symptoms** of hepatic abscess are sometimes *latent*, and instances are recorded of sudden death from rupture of hepatic abscess, the existence of which was not suspected: usually, however, this disease is accompanied by a characteristic group of symptoms and physical signs.

Pyrexia, of an irregular, intermittent, septic type, usually exists. The temperature, after being normal or sub-normal for two or three days, will rise, with a rigor, to 103° Fahr., or higher; or there may be a daily afternoon rise, without rigor. Profuse perspirations are common. These symptoms sometimes lead to the disease being regarded as malaria. There is *pain* of a dull, aching character in the right hypochondrium, extending to the shoulder, and there is tenderness on pressure over the liver. Enlargement of the liver can usually be made out, most marked, however, in the majority of cases, in the right lobe and extending upward, and to the right as the abscess cavity is more commonly nearer the upper than the under surface.

If the liver enlargement is great, as it often is, the right side may be considerably bulged, and the edge of the liver may be felt 3 or 4 inches below the costal margin. Fluctuation may sometimes be detected. Sometimes adhesions form, and the abscess points below the ribs, or in the epigastrium. The peculiar aspect of the patient is considered to be suggestive, if not characteristic, of hepatic abscess: the face is pale, the complexion muddy, the skin sallow or with a sub-jaundiced hue, the conjunctivæ are swollen and bile-tinged. If diarrhœa is present, the stools should be examined for amœbæ.

It is not very uncommon for the abscess to rupture into the pleura. Sometimes it invades the lung, "the extension may occur through the diaphragm, without actual rupture and with the production of a purulent pleurisy and invasion of the lung." Osler saw four such cases, attended by severe convulsive cough and reddish-brown expectoration of a brick-dust colour, resembling anchovy sauce, in which *amœbæ coli* were found, identical with those in the liver abscess and the stools. They displayed active amœbic movements.*

An abscess of the liver may also rupture into the peritoneum or pericardium and be immediately fatal, or into the stomach, duodenum, or colon, and the pus be vomited or discharged by the bowel. The most favourable results seem to follow spontaneous discharge through the lung, and next through the stomach and intestine.

The **treatment** of abscess of the liver must be mainly surgical. Many Anglo-Indian physicians describe forms of acute hepatitis, in what we may term the pre-suppurative stage, a pathological condition which has not been recognised in England, and they maintain that such cases, with symptoms precisely like those of hepatic abscess, often recover quickly, under the exhibition of ipecacuanha in doses of 15 to 20 grains every five, six, or eight hours, while, at the same time, morphine is administered hypodermically to relieve the pain, and hot fomentation and poultices are applied locally. It has been remarked with regard to this statement, that it is impossible to be certain that suppuration would have occurred in these cases if left to themselves, but it may be said, on the other hand, that assuming ipecacuanha to contain a principle which has the power of destroying the activity of the *amœbæ coli*, or their secretions, and supposing this principle to be soluble in the intestinal contents and to be carried to the liver through precisely the same channels as the toxic irritant, and supposing this irritant to be of only feeble virulence, there seems nothing irrational or impossible in the hypothesis that its infective potency may be stayed, and the pathological processes which might otherwise end in suppuration abated.

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* Osler's "Principles and Practice of Medicine," p. 449.

But when the diagnosis is clearly established of the existence of hepatic abscess, operative procedures should at once be undertaken. In order, however, to make this diagnosis certain, preliminary exploratory or aspiratory punctures are usually needful. Such explorations, when made with care and caution, even should no abscess be found, so far from being injurious, have actually proved beneficial and remedial. Godlee, however, appears to think that this operation is not altogether a trivial one, and not free from danger of serious hæmorrhage. It is best to combine aspiration with puncture, for sometimes the pus is so thick that, without aspiration, it will not flow through the cannula. Sometimes the abscess is found to point distinctly in the right hypochondriac or the epigastric region, then adhesions between the liver and parietal peritoneum will almost certainly have taken place, and preliminary aspiration may be immediately followed by free incision and drainage.

Since hepatic abscesses have been treated by free incision and drainage, the mortality, according to Dujardin-Beaumetz, has fallen from 80 to 32 per cent.

There exists some difference of opinion as to the propriety of first attempting to cure the abscess by aspiration only. Fagge and Whitla both quote instances of the cure of hepatic abscesses after simple aspiration and withdrawal of the purulent contents. Godlee,* however, and most other surgeons, consider, that if pus has been discovered, "the best plan is to give exit to it at once, by making a hole large enough to admit the finger, and afterwards a drainage-tube of the same size." He mentions, that if the abscess points prominently, and if the skin be reddened, adhesions will almost certainly exist, but it is best not to assume this, and "if the incision is to be made in front, to cut down very cautiously through the abdominal wall, and to ascertain the state of the case." Should there be no adhesions, "a series of stitches through the parietal peritoneum, and pretty deeply into the substance of the liver," should be made, in order to secure adhesions. "If the abscess be pointing in the side," in order to avoid the pleura, the incision should be not more than 2 inches above the margin of the ribs in the mid-axillary line. "If the pleura be opened it will be necessary to stitch the diaphragm to the costal pleura." A flanged tube, such as that used for empyema, the size of the finger and three or more inches in length, so as to go well into the cavity, should be introduced. The tube should not be taken out till the discharge has almost stopped. The dressings must be antiseptic, carbolic gauze, or Lister's cyanide of mercury gauze may be used. They must be extensive, and if the discharge be copious they will require changing in a few hours. When the abscess is deep-seated and much liver tissue has to be incised, free hæmorrhage is likely to occur. The wound must then be plugged by the finger for a minute or two, and if this does not arrest it, a plug of antiseptic material must be left in the wound for a day or two. For opening deep liver abscesses Godlee describes "a trocar, either sharp or blunt, which, as well as the corresponding cannula, is grooved upon one side. This is to be plunged into the abscess, and then a fine pair of dressing forceps is to be run along the groove, and the track is to be widened by expanding the blades; or, if thought safe, a bistoury may be employed for the purpose."

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* "Lectures on the Surgical Aspects of Hepatic Abscess." *British Medical Journal*, January, 1890.

The best results are obtained in cases of single abscess situated near the surface and not complicated with dysentery. The presence of adhesions must be ascertained, and the precautions above mentioned carefully observed. "If the abscess have burst into lung, pleura, pericardium, or kidney, and the position of the abscess can be clearly determined, it must be opened without delay. If the existence of an abscess be only suspected, and the patient be losing ground, it is right to puncture the liver in the most likely situations, bearing in mind that, though usually quite harmless, a slight amount of risk accompanies this very trivial operation. . . . If, on the other hand, whether the abscess have ruptured or not, there are no means of diagnosing the whereabouts of the matter, and the patient be not losing or even gaining ground, the surgeon should hold his hand for a time" (*Godlee*).

3. CHRONIC INTERSTITIAL HEPATITIS, CIRRHOSIS, GRANULAR OR "HOB-NAILED" LIVER.

This is a form of chronic or subacute hepatitis affecting the smaller branches of the portal vein and the surrounding connective tissue, and resulting in a considerable proliferation of this tissue by production of young connective tissue elements from those already existing. Subsequently this new connective tissue undergoes cicatricial retraction, so that the proper gland structure of the liver becomes strangulated and in part destroyed. In this contraction and strangulation the branches of the portal vein become obstructed and to some extent obliterated, and the bile ducts also to a certain degree, and a considerable portion of the liver cells atrophy and disappear.

Essentially then, in its most typical form, this disease consists in an irritative or inflammatory overgrowth of connective tissue, which, in the contraction it afterwards undergoes, obstructs the portal circulation and destroys the liver cells. In this typical *atrophic* form, the liver becomes greatly diminished in size, firm, hard, fibrous, and resistant. On section "the substance is seen to be made up of greenish-yellow islands, surrounded by greyish-white connective tissue." The name "cirrhosis" was given to this disease by Laennec, on account of this yellow colour seen on section.

This form of interstitial inflammation appears to be usually caused by the passage into the blood of the portal vein of some irritant, which is carried to the liver and there sets up an irritation and proliferation of the connective tissue, which ultimately leads to the development, as we shall see, of most serious and often fatal changes.

This irritant, according to general experience, is most commonly **alcohol.** And pure spirit, not much diluted and taken without food, is most prone to lead to this disease; hence another name given to it, viz. "gin-" or "spirit-drinker's liver." The fusel oil in ardent spirits is believed to be the irritating element. Other substances may, possibly, have the same effect, such as rich, highly-seasoned food, or the absorption of ptomaines or other animal alkaloids from the alimentary canal.

It occurs far more frequently in males than in females, and in middle- and after-life than in youth. Its occasional occurrence in childhood has been advanced in proof of the existence of a non-alcoholic form, but many of these cases can also be traced to alcohol or some other irritating ingesta; a few, however, appear to be traceable to an acute interstitial hepatitis, set up by scarlet fever or other infective disease. Syphilitic and malarial forms are also recognised. We have already alluded to the hyperæmic "cardiac liver" which so frequently accompanies chronic heart disease; wasting of the central cells of the hepatic lobules, and hyperplasia of the connective tissue may occur in this form and so produce a cirrhotic condition.

The liver is not diminished in size in all cases of cirrhosis. Even in the typical atrophic form there is moderate increase of size in the early stage, chiefly due to hyperæmia. There is also a form which has been described as "*fatty cirrhosis*," and this, according to Osler, is quite as common in America as the atrophic variety. The liver is "enlarged, smooth or very slightly granular, anæmic, yellowish-white in colour, and resembles an ordinary fatty liver. It is, however, firm, cuts with resistance, and microscopically shows a great increase in the connective tissue." It is most common in beer drinkers. The form associated with *perihepatitis* cannot be distinguished clinically from the atrophic form.

Much has been written on the subject of *Hypertrophic Cirrhosis*, and this term has probably been applied to a variety of conditions;* it should, however, be restricted to the form first described by French writers, and termed *biliary* cirrhosis. It will be sufficient here to say that this form is characterised by permanent enlargement of the liver, "a marked involvement of the smaller biliary canaliculi, and retention, in an unusual degree, in comparison with atrophic cirrhosis, of the number and form of the liver cells, in spite of the great increase of the lobular connective tissue." † Osler had a case of this kind in which the liver weighed seven pounds. The surface, unlike that of the atrophic form, is smooth; "it is exceedingly firm, resists cutting, and presents on section a deep greenish-yellow colour." His cases had all been hard drinkers. The chief clinical differences between the hypertrophic and the atrophic form are that in the former there is *persistent jaundice*, which may be intense, although the stools are bile-stained; and the absence of *ascites*. It may run a very chronic course (3 to 10 years,‡), and is apt to terminate with the symptoms of acute febrile jaundice. "The patient may present every feature of acute yellow atrophy,' the sole diagnostic criterion being the enlargement of the liver. Dieulafoy maintains that there are "mixed" cases, and that the two forms run into one another.

To return to the common type of atrophic cirrhosis and its symptoms. These depend on the two essential elements of the disease: obstruction to the portal circulation and destruction of liver cells. It is remarkable that the most extreme degree of atrophic cirrhosis may occasionally exist without symptoms, owing to the establishment and maintenance of a collateral compensatory circulation of complete efficacy. This takes place through anastomosis between rootlets of the portal veins and those of the general venous system; between those of the œsophagus and stomach, and between the rectal and iliac veins; and much of the blood of the portal vein doubtless also gets into the veins of the abdominal wall and through them into the internal mammary veins. *

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* This is clear from the fact that in the discussion on "Varieties of Hepatic Cirrhosis," at the Birmingham meeting of the British Medical Association in 1890, one of the speakers is reported to have said, "The cases of cirrhosis which were curable were those of the hypertrophic kind," whereas the introducer of the debate spoke of the prognosis in these cases as being "very unfavourable," and Dieulafoy alludes to it as "*fatalement mortelle*"!

† Osler's "Practice of Medicine," p. 441.

‡ Dieulafoy.

But the establishment of such a complete compensatory collateral circulation as this is extremely rare, and symptoms, due to engorgement of the tributaries of the portal vein, are usually prominent. The earliest to appear are those due to gastro-intestinal catarrh, to which the habit of spirit-drinking may have, directly as well as indirectly, contributed,—a tremulous and furred tongue, nausea and vomiting, especially on getting up in the morning, loss of appetite, flatulence, irritability of bowels, and sleeplessness. Congestion of the stomach often leads to hæmatemesis, which may be profuse and repeated. It is followed by melæna. The spleen is usually enlarged also from congestion. Greatly enlarged superficial veins may often be seen over the abdominal and lower thoracic regions. Ascites often supervenes, and with it some œdema of the feet, but general dropsy is rare. Slight jaundice may appear in a certain proportion of the cases, but it is more frequently absent. The urine is scanty, loaded with urates, and sometimes contains a little albumen. Hæmorrhoids are often present.

A slight rise of temperature has been noted in some cases. The aspect of the patient is often characteristic; he is thin and ill-nourished, with

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* For a complete account of the development of this remarkable collateral circulation *see* Osler's "Practice of Medicine," p. 442, and Fagge's "Practice of Medicine," vol. ii. p. 371.

watery conjunctivæ, sunken eyes, muddy icteroid complexion, and distended venules (stigmata) on the nose and cheeks. In the early stage the liver will be found enlarged and tender. When ascites is present it will be difficult to examine the liver, but after removal of the fluid the liver will be found diminished in size, and its surface hard, firm, and granular.

The preceding symptoms are due to obstruction. *Toxic* cerebral symptoms may also develop at any period, noisy delirium or stupor, coma and convulsions. What particular toxic agent produces these symptoms is as yet undetermined; they are analogous to those of uræmia arising in connection with renal disease, for which they have sometimes been mistaken.

Symptoms similar to these may appear in cases of *fatty cirrhotic* liver, but this form is more commonly latent and rarely directly fatal. These are the cases often diagnosed as "hypertrophic cirrhosis."

With this brief preliminary account of the nature, causation and symptoms of hepatic cirrhosis before us, we may now be able to formulate some rational *indications* for its **treatment.** In the *first* place, there is the *causal indication*, *i.e.* the avoidance of all alcoholic or other irritating ingesta. *Secondly*, there is the indication to relieve the symptoms of co-existing gastro-intestinal catarrh, due in part to the same cause as the cirrhosis, viz. alcohol, and in part to the obstruction in the portal vessels. *Thirdly*, there is the indication to lessen the portal engorgement by whatsoever means we can safely employ for that purpose. *Fourthly*, there is the indication to relieve urgent symptoms that may arise, such as hæmatemesis and ascites. *Fifthly*, there is the indication to relieve blood contamination (toxic symptoms) arising from the interference with the excreting functions of the liver, caused by compression of the bile ducts and atrophy of the liver cells. And *sixthly* and lastly, there is the indication to endeavour to maintain the nutrition of the body and to support the strength of the patient in a disease in which both are gravely compromised. Let us now see how we are to fulfil these indications.

1. In the first place, the diet must be most strictly limited to such foods and beverages as are absolutely unirritating and easy of digestion and assimilation. Although it may be needful in *advanced* cases to give small quantities of dilute alcohol to maintain the patient's strength, in *early* and remediable cases all forms of alcohol should be entirely forbidden.

An *exclusive milk diet* has been advocated by many physicians as of the greatest value in arresting the progress of this disease. "It is capable," says Dujardin-Beaumetz, "itself alone of bringing about ameliorations equivalent to cures."* Semmola and Osler also commend it highly. Whitla, in Ireland, has found butter-milk a most useful food. Without limiting the patient absolutely to milk we would strongly recommend that it should be made the chief article of diet, and in cases in which it is not well borne, if given pure and by itself, it should be mixed with an equal quantity of some alkaline water, such as Vichy, Vals, or Apollinaris; or, with patients who cannot afford these waters, 10 or 15 grains of sodium bicarbonate should be added to each tumblerful of warm or hot milk and water. Equal parts of milk and thin oatmeal gruel, hot or cold, is a very nourishing and pleasant drink. Or the milk may be boiled and thickened with arrowroot or isinglass, so that when cold it forms a jelly, and this may be eaten with a dry biscuit. Milk soup, made by adding to hot milk some well-cooked fresh vegetables and flavouring with celery salt, or some Spanish onion, or thickening with vermicelli or macaroni, is a good variation of the monotony of milk diet. Well-cooked, fresh vegetables and fruit may be allowed in moderation. All fats and saccharine foods should be forbidden, and animal food generally, if not wholly proscribed, should be reduced to a minimum, and the most delicate kinds alone permitted, such as a little boiled chicken, or boiled or grilled sole or whiting.

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* "Clinique Thérapeutique," vol. ii. p. 140.

In advanced cases, where no hope of any great or permanent amelioration can be entertained, and where it is chiefly a question of maintaining the rapidly-diminishing strength of the patient, we may be obliged to give nourishing animal broths and jellies, and such stimulants as champagne or brandy with some effervescing water.

2. A diet such as has been indicated will contribute greatly to the relief of the symptoms of gastro-intestinal catarrh, which are amongst the earliest indications of the existence of this disease; but we have also medicinal measures at our service of no mean utility. One of the most serviceable is the regular depletion of the engorged portal vessels by suitable aperients. A pill of $\frac{1}{6}$th or $\frac{1}{8}$th of a grain of podophyllin (or 2 grains of *iridin*), with 1 to 2 grains of extract of aloes, a grain of soap and a little oil of peppermint or caraway, should be given every other night, and 1, 2, or 3 drams, according to the sensitiveness of the patient to aperients, of Carlsbad salts, in half a tumblerful of hot water, should be given the first thing every morning. This, in the early stages, will relieve the hepatic congestion, and probably thereby arrest the progress of the disease, while, in more advanced cases, it unloads the abdominal veins, prevents or postpones the occurrence of hæmatemesis and ascites, sweeps away the decomposing residue of imperfect digestion, and so avoids blood contamination or distressing flatulent distension.

Much the same effects are produced by courses of mineral waters, such as the courses at Carlsbad, Marienbad, Kissingen, Tarasp and Brides, and in some cases such milder courses as Vichy, Ems, or Neuenahr. Warm alkaline waters, such as these latter, undoubtedly exercise a favourable influence over the gastro-intestinal catarrh, but they are rarely so efficacious of themselves as the other alkaline and aperient springs named. At these spas the regular use of warm stimulating baths serves to maintain the cutaneous functions in activity; and the regular exercise in the open air, which forms part of the routine of this cure, is also most advantageous. It must, of course, be remembered that it is only in the treatment of the first stage of the disease that these mineral waters are applicable. The useful effects of alkalies in relieving the gastro-intestinal catarrh can be obtained at home, without the trouble of going to these spas.

The following dose may be ordered three or four times a day, about half an hour before taking food—

℞ Sodii bicarb.	15 grains.
Potassii bicarb.	5 ,,
Spir. ammoniæ aromat.	½ dram.
Infusi aurantii comp. (*vel* aquæ menthæ pip.)	ad 1½ oz.

M. f. dosis.

This dose may be usefully diluted with an equal quantity of hot water; this will assist in dissolving and washing away stringy mucus from the mucous membrane of the stomach. If there is pyrosis and morning vomiting of catarrhal secretion from the stomach, half a dram or a dram of the liquor bismuthi et ammonii citratis may, for a time, be added to each dose of the above mixture. If there is constant nausea, a dram of aqua laurocerasi should be added to each dose; or, should there be much gastric pain and irritability, 3 to 5 minims of liquor opii sedativus may be added instead. Symptoms of an excessive amount of intestinal decomposition, such as great flatulent distension, etc., will be best relieved by a pill containing half a minim of creasote or a grain of thymol, two or three times a day.

We are doubtful as to the existence of any special virtue in nitro-hydrochloric acid in the treatment of these cases; it has, however, been warmly advocated by Whitla, who attributes its frequent failure to produce any good effects to its liability to decomposition, and urges that it should be always freshly prepared. He uses it locally as well as internally. For the former purpose he applies a lotion, made by mixing $\frac{1}{2}$ ounce of strong nitric acid and 1 ounce of hydrochloric acid with a gallon of warm water on spongio-piline, to the whole of the hepatic region, until an eruption appears.

3. The treatment we have advocated for the relief of the gastro-intestinal catarrh, especially the *use of regular aperients*, will also apply to the third indication, viz. to lessen the portal engorgement. Counter-irritation to the hepatic region, by linseed and mustard poultices, or by means of "chillie paste," and the abstraction of blood by applying leeches to the anus, have their advocates, and they may be useful in the early stages of hepatic engorgement; but free and regular purgation by non-irritating aperients, such as we have already described, is the most trustworthy measure.

4. The relief of such urgent symptoms as hæmatemesis, and those that arise from a great accumulation of ascitic fluid in the peritoneal cavity, of course demand careful consideration. The management of cases of hæmatemesis has been fully considered in a former chapter (vol. i. p. 117). When it depends on portal obstruction, as in this disease, free purgation by the alkaline sulphates, given in combination with dilute sulphuric acid, should follow the other measures that have been recommended for the arrest of the bleeding.

With regard to the treatment of **ascites**, authoritative opinion is now much more in favour of early and frequent *tapping* than was formerly the case.

It used to be thought that the occurrence of ascites was the almost certain precursor of a fatal termination of the disease; and it used to be argued that as, in the great majority of such cases, the obstruction to the portal circulation was extreme and irremediable, and that as soon as the ascitic fluid had been removed by tapping it was certain to re-accumulate, we were only, as it were, bleeding the patient into his own peritoneal cavity, and so rapidly exhausting him, and thereby hastening the fatal event. "Tapping," says Dujardin-Beaumetz, "in true cirrhosis, instead of prolonging existence, on the contrary hastens the end." It is true, he qualifies this statement subsequently and admits that in some cases a cure follows frequent paracentesis. Should the cirrhotic changes in the liver be only partial, and should there be no difficulty in inducing the patient to follow such a course of living as will favour the arrest of the disease, and should a sufficient collateral circulation be established by the numerous venous anastomoses, which, we know, may be developed, then tapping, by taking off the pressure from the abdominal cavity, aids the portal and general circulation, and puts the patient in a more favourable situation for recovery than he was before. He approves, therefore, of tapping in young, vigorous subjects, with the nutritive functions intact, but he does not think it should be repeated if the abdomen *rapidly* refills, *i.e.* in three or four days; but if a re-accumulation does not take place for some weeks or months, then, when the ascites recurs, the fluid may again be removed by puncture. "But," he adds, "when the patient is very cachectic, when he has wasted considerably, and appears no longer able to assimilate food, in that case, if you wish to prolong life, you should not prescribe paracentesis." *

No doubt the majority of cases of hepatic cirrhosis, when they reach the stage of the appearance of ascites, are in a bad way; but we agree with Bristowe and Saundby that in a considerable minority of such cases recovery takes place under suitable treatment; † and until the effect of the operation has been tested it is difficult to determine whether or not the case is past remedy, and if it is past remedy, little harm can be done by paracentesis. In any case it seems to us better that the distressing pressure of the fluid accumulation, when very large, should be removed by this slight operation, than that the patient should be daily depleted by large doses of hydragogue cathartics ; and diuretics, in very large accumulations, are generally useless, owing to the pressure of the ascitic fluid on the kidneys. One of Bristowe's cases recovered after fourteen tappings ; and Whitla mentions a case that had been tapped fifty times and recovered.

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* "Clinique Thérapeutique," vol. ii. p. 143.

† Bristowe, "Observations on the Cure or Subsidence of Ascites due to Hepatic Disease;" *British Medical Journal*, April 23, 1892. Saundby, "Remarks on the Varieties of Hepatic Cirrhosis;" *British Medical Journal*, December 27, 1890.

The operation of **paracentesis abdominis,** although a very simple one, should be performed with care and caution. The patient should be first given a little stimulant, then the surface of the abdomen, where the puncture is to be made, should be washed with antiseptic fluid, the bladder should be emptied, the point where the trocar is to enter should be marked—the median line, midway between the umbilicus and the pubis, is that usually selected—avoiding, of course, any dilated superficial vein ; if thought necessary, the spot selected may be rendered anæsthetic by ether spray, by a mixture of ice and salt, or by injecting under the skin a little strong solution of cocaine ; a small incision with a scalpel or lancet should first be made through the skin, and then the trocar and cannula (which should be a moderately fine one, as there is certainly no advantage in a rapid removal of the fluid) quickly introduced ; these instruments should, of course, be carefully cleansed, so as to be made perfectly aseptic. Before the operation a many-tailed (3 or 4 tails) flannel bandage should be applied to the back and the ends held by the assistant or nurse, ready to compress the abdomen from above downwards as the fluid escapes, and when the operation is completed the ends should be firmly fastened, and the bandage arranged so that uniform pressure may be maintained over the abdominal surface. It is often convenient to attach a long indiarubber tube to the cannula, so as to conduct the fluid, as it slowly flows away, to a vessel near the patient. If the patient should feel faint during the withdrawal of the fluid some more stimulant must be given. As much fluid should be withdrawn as possible, unless the patient shows any unfavourable symptom during its removal. After taking away the trocar, the wound in the skin should be pinched close by the finger and thumb, and some antiseptic cotton wool and collodion applied.

The use of **diuretics** and **purgatives,** which often fail to have any effect on the dropsical accumulation before paracentesis, may often be usefully applied after the operation, to further the complete removal of the ascitic fluid, and to prevent its rapid re-accumulation.

They may also be used in those cases where, for some reason or other, it is determined not to tap the patient.

The purgatives usually employed are sulphate of magnesia, in half-ounce doses, dissolved in as little water as possible, and given in the morning early, half an hour at least before breakfast; or compound jalap powder, in dram- or dram-and-a-half doses, given with a little warm water at the same hour; or elaterium, half a dram or a dram of the compound tincture, in a little warm water, may be given early in the morning. This last drug should only be used occasionally; it is apt to be uncertain in its action, sometimes scarcely acting at all, and at other times acting too violently and producing much depression.

Certain diuretics are undoubtedly valuable, and favour the removal of the fluid. One of the most popular and useful is the well-known pill of digitalis, squills and mercury (a grain of blue-pill and of powdered digitalis and squill in each); one of these should be given twice daily. Some prefer $\frac{1}{4}$ grain of calomel in place of the blue-pill—indeed, calomel alone has been found a very efficient diuretic in many cases. A combination of calomel and caffeine, $\frac{1}{2}$ grain of the former and 2 or 3 grains of the latter, has been found to be retained in the stomach when other drugs have been rejected, and to act well as diuretics. Various other diuretics have been employed in these cases; a favourite combination consists of a mixture containing 30 grains of potassium acetate, ½ dram of spirits of nitrous ether, ½ dram of spirits of juniper, and ½ ounce of infusion of digitalis, in each dose, which should be given thrice a day. Hydrochlorate of cocaine, ¼ grain every three hours, has been reported to act as an efficient diuretic "when the effects of the other drugs appear to be lost."*

Resin of copaiba, in 15-grain doses, has been warmly advocated as a diuretic in hepatic ascites. It may be rubbed up with compound almond powder and water into an emulsion.

Iodide of potassium and chloride of ammonium have been highly lauded by some physicians in the treatment of hepatic cirrhosis, not so much as diuretics, but for some supposed special action. We doubt if ammonium chloride has any special action on this disease. Potassium iodide, however, appears to have some influence in checking the advance of sclerosing processes; it often acts powerfully as a diuretic, and as it is sometimes impossible to say whether or not the cirrhosis, or the ascites, may have a syphilitic origin, we think it is advisable to try the effect of this drug, for a time, in most intractable cases, and it is as well, in order thoroughly to eliminate the possibility of syphilis, when we are in doubt, to combine with it small doses of perchloride of mercury.

In all these cases it is highly important to combine, with our other measures, a supporting tonic treatment. The appetite may be maintained or improved by some vegetable bitter, such as gentian, or quinine, or nux vomica, or strychnine, given an hour before meals. A light nourishing dietary should be provided, and it may be necessary, in some advanced cases, to allow a small amount of wine or spirits well diluted.

5. When **toxic** symptoms appear the disease is usually advanced, and little can be hoped from treatment. In the absence of diarrhœa, the effect of brisk purging may be tried, and the action of the skin should be promoted as in uræmic cases.

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* Hare's "System of Practical Therapeutics," vol. ii. p. 811.

6. The maintenance of the strength of the patient, by supporting and tonic treatment, has already been insisted upon.

A few words remain to be said as to the treatment of certain varieties of hepatic cirrhosis.

In *biliary cirrhosis*, where there is obstruction of the bile ducts and marked jaundice, and usually no ascites, the indications for treatment do not differ greatly from those of the typical form. It is even less amenable to any but palliative measures. The bowels should be regulated by the aperient sulphates, such as Carlsbad and Marienbad salts; warm alkaline drinks, such as Vichy or Apollinaris water, should be given half an hour or an hour before food, and the diet should be light and simple.

Syphilitic cirrhosis, which may be met with in children and young adults from inherited syphilis, and which is occasionally associated with gummata in the transverse fissure compressing the portal vein, or the hepatic ducts, so as to give rise to jaundice or ascites, requires the administration of potassium iodide and mercury, as we have already pointed out.*

In so-called *malarial cirrhosis* the liver is usually enlarged, and the symptoms are somewhat indefinite, but jaundice is usually present. A course of Carlsbad or Vichy waters, or regular use of the alkaline and saline aperient salts derived from these springs, with an occasional mercurial or other cholagogue purge, should be prescribed. The use and application, as already described, of nitro-hydrochloric acid is especially applicable to these cases. Arsenious acid ($\frac{1}{50}$ of a grain) in a pilule after each meal, continued for some time, is also of great use in attacking the malarial element.

In conclusion, we must remark that hepatic cirrhosis is a *remediable*, but not a *curable* disease.

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* Bristowe has reported a remarkable instance of this form of ascites, in which all treatment failed until the syphilitic nature of the case was accidentally discovered. (*British Medical Journal*, April 23, 1892.)

As Osler well observes, "So far as we have any knowledge, no remedies at our disposal can alter or remove the cicatricial connective tissue which constitutes the *materia peccans* in ordinary cirrhosis. On the other hand, we know that extreme grades of contraction of the liver may persist for years without symptoms when the compensatory circulation exists. The so-called cure of cirrhosis means the re-establishment of this compensation." *

ADDITIONAL FORMULÆ.

Purgative pills in hepatic cirrhosis.

℞ Pulv. rad. rhei, 2 drams.
Extr. aloes, 30 grains.
Extr. colocynthidis, 6 grains.
Extr. rhei, q.s.

Ut f. pil. 60. Two to be taken twice a day.
(*Bamberger.*)

Pills in hepatic cirrhosis.

℞ Podophyllin, 6 grains.
Capsici, 4 grains.
Pulv. rhei, 12 grains.

M. et div. in pil. 12. One on alternate nights. (*Da Costa.*)

In early stage of hepatic cirrhosis.

℞ Sodii bicarb., ½ oz.
Infusi gentianæ, 6 oz.

M. f. mist. A tablespoonful three times a day, after or between meals. (*Da Costa.*)

Pills in chronic hepatitis.

℞ Extr. taraxaci, 36 grains.
Extr. aloes, 12 grains.
Extr. colchici acet., 6 grains.
Pulv. ipecac., 6 grains.

M. et div. in pil. 12. Two every night. (*Martin.*)

In hepatic congestion.

℞ Ammonii chloridi puri, ½ oz.
Aquæ menthæ pip., 3 oz.

M. f. mist. A dessertspoonful three times a day.
(*Murchison.*)

Mixture in hepatic cirrhosis.

℞ Acid. nitro-hydrochlor. diluti, ½ oz.
Extr. taraxaci liquid., 2 oz.
Tinct. nucis vom., 3 drams.
Ext. cinchonæ liquid., 3½ drams.
Infusi chiratæ ad 12 oz.

M. f. mist. A tablespoonful in a wineglassful of water to be taken four times a day before food. (*Whitla.*)

Diuretic pill and mixture.

℞ Pulv. scillæ, 1½ grain.
Pulv. digitalis, ½ grain.
Pil. hydrargyri, 2 grains.

M. f. pil. To be taken two or three times a day.

℞ Potassii acetatis, 20 grains.
Spir. ætheris nitrosi, ½ dram.
Decoct. scoparii ad 1½ oz.

M. f. haust. To be given with each dose of the above pills. (*Murchison.*)

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* "Practice of Medicine," p. 445.

CHAPTER IV.

THE TREATMENT OF HYDATID CYSTS OF THE LIVER.

Origin, Nature, and Development of Hydatid Cysts—The *Tænia Echinococcus*—Prophylactic Measures—Characters of Hydatid Fluid—Symptoms often Absent, sometimes Obscure—Possible Results—Spontaneous Cure—Suppuration with Pyæmia—Rupture. Treatment—(1) by Internal Medication—Potassium Iodide, etc. (2) Simple or Electro-puncture—Urticarial Rashes after Puncture. (3) Tapping with Aspiration—Different Opinions as to its Safety—Aspiration with Hypodermic Syringe. (4) Injection of Medicinal Substances. (5) Abdominal Section, Free Incision and Drainage—Advantages of this Method—Mode of Procedure—Advantage of Preliminary Aspiration—Antiseptic Irrigation.

A **globular painless tumour** in the hepatic region is generally a hydatid cyst. A hydatid cyst is not, strictly speaking, a *disease of the liver*, as it may and does occur in other organs, but clinically its consideration is not unnaturally associated with that of enlargements of this organ, and its treatment may therefore be now conveniently considered. A hydatid cyst in this situation may attain a great size without giving rise to any complaint, and it has not infrequently happened that the presence of such a cyst has only been discovered when some accidental circumstance has led to its rupture.

In order to consider the subject from the point of view of prophylaxis, as well as of cure, it will be needful to refer briefly to the origin and nature of these remarkable cysts.

A hydatid cyst represents a phase in the singular life-history of a very small tapeworm, the **Tænia echinococcus,** found in the intestine of the dog. This tapeworm, when fully grown, only measures $\frac{1}{6}$ of an inch in length, and consists of but three or four segments, the last segment containing the sexual organs, and in this the vastly numerous ova are developed and pass out of the dog's intestine with the fæces; they are thus liable to pass into any open watercourse, or to be deposited on the leaves or stalks of fresh vegetables. Should this ovum reach the human stomach its shell is dissolved by the gastric juice, and the liberated embryo, by means of six small hooks with which it is provided, bores its way through the walls of the stomach or intestine and most commonly gets conveyed to the liver, probably by penetrating into one of the tributaries of the portal vein and being carried onwards by the portal blood stream until it is arrested in one of the portal capillaries; hence it finds its way into the hepatic tissue. Here the hooklets disappear, and the embryo is gradually converted into a small cyst. It grows larger and becomes converted into a vesicle containing a transparent fluid. Besides its own proper capsule, it becomes enclosed (probably by irritation of surrounding tissue) with a distinct investing membrane of vascular connective tissue. This outer capsule grows with the hydatid. The subsequent development of the hydatid is of some practical importance. From the interior of the parent or "mother cyst," usually a number of buds or smaller cysts develop; these, at first attached by a pedicle, are afterwards set free and are termed "daughter cysts," and within them "granddaughter cysts" may develop in the same manner; so that the parent cyst may become filled with a vast number of smaller cysts of various sizes. Subsequently the interior of the parent cyst develops buds, which, instead of forming detached vesicles, remain connected with it and form *scolices* or *heads*, provided with suckers and hooklets, and these, if they reach the intestine of a suitable host, are capable of growing into tæniæ.

So far, then, as prophylaxis in the human subject is concerned, the chief measure is to avoid all drinking water or food substances that can by any possibility have become contaminated with the excrement of dogs. This is especially important in countries such as Iceland and in some parts of Australia, where this parasite is known to abound in the intestines of these animals. In some countries it is extremely rare, as in America; it is said to be common in London dogs (*Fagge*), but as there are practically no open water-courses in London from which drinking water is derived, it must be from allowing dogs to live in the same apartments, and in great intimacy with human beings, that the latter become affected, doubtless by the pollution of some articles of food.

In Iceland, owing to the great number of dogs there (equal to nearly one-third of the population), and the domestic intimacy permitted them, this disease is so common that it has been estimated to be present in from a tenth to a thirteenth of the entire population. In Australia, also, where dogs are employed in great numbers for herding sheep, this malady is common. The sheep are the hosts of the larval form, and as their intestines, after slaughter, are commonly given to the dogs to eat, the circle of infection is maintained.

The temptation to drink, in such countries, from a running stream or from a spring that is open to possible contamination, should be resisted, and the risks attendant thereon should be pointed out to peasants, soldiers, workmen, travellers, and others who are especially exposed to this temptation. Boiling, or filtering through a charcoal filter, will render such water safe.

The fluid of a hydatid cyst is clear and limpid, of a specific gravity of 1,005 to 1,009. It does not contain albumen and is not rendered cloudy by heat or nitric acid. It contains traces of sodium carbonate and chloride, and it is said, occasionally of sugar. When this fluid is withdrawn by puncture, scolices or *echinococci* can often be found floating in it or deposited from it, or hooklets may be found in the deposit, either being diagnostic of the nature of the fluid.

Symptoms, as we have already said, are sometimes entirely absent, even in the case of large cysts—

this, of course, depends on their situation. Sometimes the cyst forms a distinct globular tumour in the epigastric region, or it may protrude the ribs and intercostal spaces in the right hypochondrium, or appear below the costal arch; or it may project from the upper surface of the right lobe of the liver and encroach on the pleura and lung, and give rise to a peculiar arched area of dulness in the lower and back part of the chest on the right side; or it may be more deeply seated, and then it may give rise to symptoms of some obscurity. If the cyst is superficial it can usually be recognised by its smooth, rounded form, its tense, firm feel, and sometimes by fluctuation. The so-called *hydatid fremitus* is often absent, and must not be regarded as of much significance. Some weight and dragging, and sometimes pain in the hepatic region, are associated with large cysts.

The presence of other symptoms may be determined by the *result* of the disease: (1) The hydatid may die, the cyst then diminishes in size, the capsule thickens, shrinks, and becomes calcified, and the contents dry up into a putty-like mass and there is *spontaneous cure.* (2) The cyst may *suppurate*, and pyæmic symptoms may appear, rigors, sweatings, emaciation, and more or less jaundice, and the surface of the tumour may become hot, tender, painful, and red, and it may sometimes be difficult to distinguish it from a hepatic abscess. (3) The cyst may *rupture*, before or after suppurating, into any of the surrounding parts, or externally; rupture into the peritoneum is usually quickly fatal; into the pericardium or into the vena cava is immediately fatal; into the bile ducts causes intense jaundice, and is almost invariably fatal; into the stomach, colon, pleura, or bronchi may be attended by recovery; the last event is the most favourable.

The **treatment** suitable to hydatid cysts of the liver must depend somewhat on their size, their situation, and the presence or absence of signs of suppuration of the cyst. Small cysts, not exceeding a small orange in size, and not showing any tendency to increase, and not giving rise to any pain or inconvenience, may be left alone with a fair prospect of their undergoing spontaneous cure; for it must be borne in mind that dangerous symptoms have been occasionally observed to follow every kind of operation for the cure of hydatid cysts of the abdomen. Some authorities point to the serious symptoms which may follow aspiration or puncture, and advocate free incision and drainage; and others point to the fact that a mortality of more than 10 per cent. has been reported after abdominal section for hepatic hydatids.*

The several measures that have been advocated for the treatment of hydatid cysts of the liver are the following:—

1. Internal medication. 2. Simple or electro-puncture. 3. Tapping, with or without aspiration. 4. Injection of medicinal substances into the cyst. 5. Abdominal section, free incision, drainage and irrigation.

1. *Internal medication* is now generally discredited. Kamala, sodium chloride, and potassium iodide have been advocated; the last-named drug has been spoken favourably of by Professor Jaccoud and by Semmola. Semmola maintains that he has demonstrated the presence of iodine in the fluid of the hydatid cyst in certain cases, after the exhibition of potassium iodide. After a few days of treatment with the iodide he withdraws some of the liquid by aspiration, and if he finds iodine in it he continues the treatment, and obtains a reduction in the size of the tumour and its conversion into a solid mass; if, on the contrary, he fails to find iodine in the fluid aspirated, he adopts another method of treatment. An obvious source of fallacy here is that simple puncture and withdrawal of even a small quantity of

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* Whitla mentions ("Dictionary of Treatment") that Gardner lost five out of 47 cases of abdominal incision for hepatic hydatids.

fluid will suffice, of itself, to effect a cure in many cases.

2. *Simple* or *electro-puncture* was found by Fagge to be a most effectual means of curing some forms of hydatid tumour. He believed that the application of the galvanic current was not an essential part of the process, but that the simple insertion into the cysts of one or two slender gilt needles (with antiseptic precautions, of course), which were left there for ten minutes and then carefully withdrawn, sufficed for the cure.

This treatment is only applicable to hydatids of moderate size and that are quite superficial. Fagge believed that in these cases the death of the parasite was due to an escape of some of the hydatid fluid into the peritoneal cavity, and this belief was founded on the observation that in some instances fluctuation could be detected in the lower part of the abdominal cavity a few hours after electrolysis, and that an *urticarial rash* appeared a day or two afterwards. Such a symptom has often been observed to follow the absorption of hydatid fluid, and is believed to be caused by some toxic substance contained in it.

3. *Tapping*, together with *aspiration*, is a suitable and safe measure with hydatid cysts of moderate size and superficially situated.

If a fine capillary trocar and cannula be used, if antiseptic precautions are carefully observed, if great care and caution be taken in their introduction and removal, and if the aspirating suction be not too strong, we believe this to be a perfectly safe measure. Some difference of opinion, however, exists amongst authorities, as to the safety and suitability of this practice. Fagge thinks aspiration inapplicable, and possibly injurious, if the cyst is enclosed in the liver. "To exert forcible suction," he says, "by an aspirator upon a cyst surrounded by solid tissue must involve some risk." But there seems to be no reason whatever for using "*forcible* suction," a slight suction-force should be sufficient to withdraw a *portion* of the fluid, and that, according to Fagge, is all that is necessary "to ensure the ultimate disappearance of the tumour." Dujardin-Beaumetz, however, urges as an important precaution, "that all the fluid should be withdrawn from the cyst," and that the "aspiration should be as complete as possible." *

If we are disposed to trust to the withdrawal of a *small portion* of the fluid in order to effect a cure, a very useful instrument for the purpose is a syringe, made precisely like a hypodermic syringe only much larger, to hold at least an ounce of fluid, and it should be furnished with a needle about twice as stout and three or four times as long as the hypodermic needle. This is a very handy instrument for exploratory punctures, and in a small or moderate-sized hydatid cyst, two punctures (which would give no more pain than the two needle punctures advised by Fagge) cautiously made, and the withdrawal of two ounces of fluid, if it did not suffice to kill the parasite, as it might do, would, at any rate, inform us as to the nature of the fluid, and if by chance the cyst had suppurated, we should know that it was necessary to resort immediately to other measures. So that we should prefer aspiration of this modified kind to acupuncture.

After tapping or aspiration the cyst sometimes, within a few weeks, increases in size, and if it be again tapped, the fluid removed will be found to be cloudy and to contain albumen. It is believed by some that this is due to the effusion of serum within the capsule; others say it is due to the death of the *echinococci*, and their solution: "they abandon to the fluid the albuminous matter of which they are formed." †

At any rate, this increase in size of the cyst should not lead us to conclude that a repetition of the aspiration is needed. It is rather an indication of changes associated with the death of the parasite, and in course of time the tumour will again diminish in size and finally disappear. Fagge laid it down as a rule that no second operation on a hydatid cyst should be performed within twelve months, unless there was some reason to think suppuration had taken place.

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* This author also insists that a capillary trocar and cannula, the piercing-point of which can be withdrawn, is much safer than a pointed needle, which may wound the wall of the cyst, and cause hæmorrhage.

† Dujardin-Beaumetz, "Clinique Thérapeutique," vol. ii. p. 159, *note*.

4. The injection of medicinal substances into the cyst, such as iodine, ox-gall, male-fern, etc., is an expedient which has nothing to recommend it.

5. Finally, we come to the method which is now most generally approved of in dealing with all the more serious forms of this disease, viz. **abdominal section, free incision, and evacuation** of the cyst by drainage and irrigation. This is the only method suitable to the treatment of suppurating cysts, and it is the best also in the case of all cysts of large size. The advantages of this method are obvious; by incision into the abdominal cavity the surgeon is able to see what he is dealing with, and to ascertain the position and relation of the tumour. It has been truly said that when a needle is plunged into the region where a hydatid cyst is situated, it is like "striking in the dark." He is also able to discover whether adhesions do or do not exist, and if they do not exist, by stitching the wall of the cyst to the parietal peritoneum and to the abdominal wall, he is able to open the cyst freely without any fear of the escape of any of its contents into the abdominal cavity; and further, by making a free opening in the cyst, he is able to explore it with his finger, and, by free drainage and irrigation, to promote its complete and aseptic evacuation.

The following is the usual mode of procedure in such cases:—The abdominal surface over the tumour is thoroughly cleansed, first, by rubbing with a nail-brush and soap and water, and secondly, by washing with an antiseptic solution (a 5 per cent. carbolic or 1 in 1,000 sublimate solution); an incision, two or three inches in length, is then carefully made through the abdominal walls down to the peritoneum, usually over the most prominent part of the tumour (or other convenient situation). If it should be found that the cyst is adherent to the abdominal wall it may be at once aspirated, and then opened by means of a large trocar and cannula or by incision with a bistoury (one of the advantages of preliminary aspiration is that, if the tumour is very large, it allows of slow and gradual reduction in size, and avoids sudden, violent and painful dragging on internal parts to which the cyst may have become adherent, as might be caused by *rapid* evacuation). But should the cyst not be adherent, it is first aspirated, so as to relieve tension, then it is stitched to the parietal peritoneum and sutured to the abdominal wall. The cyst is then freely incised, and its contents, so far as possible, evacuated. If thought necessary, its cavity may be irrigated with some warm antiseptic fluid—a weak solution of iodine is often used. The cut edges of the cyst are then also stitched to the peritoneum, a drainage-tube is inserted, and an antiseptic dressing, such as a pad of sal-alembroth wool, is placed over the wound. In subsequent dressings it occasionally happens that large masses of daughter cysts are evacuated, as well as large flakes and bands of softened and decomposing hydatid membrane, necessitating regular antiseptic irrigation.

Mr. Guy Stephen, of Cyprus, has suggested a modification of this method, which seems to have some advantages in procuring complete evacuation of the cyst, and so avoiding subsequent difficulties in maintaining asepsis. After incision of the cyst he, with his forefinger, "slightly pushes the ectocyst from the surrounding tissue, and along the finger slides a metal tube connected with an irrigator, held about eight feet from the ground, and filled with twice-boiled water of a temperature of not less than 105° to 110° F. The force of the water falling from this height completely detaches the ectocyst and forces it, whole and untorn, out of the wound. When the ectocyst is evacuated continue to irrigate, gently moving the tube over the whole surface of the false cyst until all the shreds of lowly-organised fibrous tissue, which united the true and false cysts, have been driven out of the wound, and the stream of water returns perfectly clean and clear. Dress with dry mercury cotton wool." * The metal tube used is simply a full-sized silver catheter, with the end filed off at an angle.

When a large hydatid cyst bulges the upper surface of the liver, encroaches considerably on the right pleural cavity, and pushes up the base of the lung, aspiration may be first attempted in about the eighth right interspace in the mid- or posterior-axillary line, and if, as the result of aspiration, the diagnosis is established, it may be necessary, in order to avoid rupture through the diaphragm, to incise and drain the cyst, and in this case it may be needful to do so through the chest wall. In such a case adhesions may be found between the diaphragmatic and costal pleura; but should this not be the case, it will be necessary, after dividing the chest wall in about the eighth interspace in the axillary region, to then carefully incise the diaphragm and its serous covering, and so uncover the cyst. After relieving the tension of the cyst, by removing by aspiration some of its contents, a portion of the sac should be drawn through the incision in the diaphragm and pleural cavity to the wound in the chest wall, where it should be fixed by sutures or hare-lip pins, and time allowed for firm adhesion to take place, so that, on incision of the cyst, no leakage into the pleural cavity should be possible. Three or four days may be necessary for firm adhesion to take place, then the cyst should be incised and drained in the manner already described.

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* *British Medical Journal*, September 10, 1892.

Part VI.

THE TREATMENT OF URINARY AND RENAL AFFECTIONS.

CHAPTER I.

THE TREATMENT OF MORBID STATES OF THE URINE.

Variations in Characters of Urine consistent with Health.

LITHIASIS.—Deposit of *Amorphous Urates;* its significance—Deposit of *Uric Acid;* its causation—*Treatment* of Uric Acid Deposits; *Preventive and Remedial*—Food and Food Habits—Alkalies — Water-drinking — Utility of Mineral Springs—Aperients—Exercise, Baths, and Frictions.

OXALURIA.—Mode of Origin of Oxalates in Urine—Relation to Dyspeptic States and to the Formation of Calculi—*Indications for Treatment*—Dietetic, Hygienic, Medicinal.

PHOSPHATURIA.—Deposit of *Amorphous Phosphate of Lime*; its significance—Treatment of habitually alkaline Urine—Deposit of *Triple Phosphate* in decomposing Urines—Relation to Vesical Calculus—Causation—*Bacterial* Agency—Relation to *Cystitis—Indications for Treatment.*

HÆMATURIA.—Etiology—Sometimes Endemic and Parasitic—Seat of Hæmorrhage — *Treatment* — Indications — Rest, Bland Drinks, Astringents, Ergotin, etc.

HÆMOGLOBINURIA.—Characters of the Urine—Different Forms—*Paroxysmal* Form—Causation—*Treatment*—Protection from Chill—Drugs—*Toxic* Form.

CHYLURIA—Origin—Prophylaxis—Treatment.

ALBUMINURIA—As a Symptom of various Diseases—In "apparently Healthy" Persons—Conditions under which it occurs—*Treatment.* Additional Formulæ.

WE shall consider the subject of the **treatment** of urinary and renal affections under two principal divisions: 1. The treatment of morbid states of the urine, together with that of renal calculi; and 2. The treatment of congestive and inflammatory diseases of the kidneys. We shall, however, reserve the consideration of the treatment of diabetes until we deal with the subject of constitutional diseases.

Many morbid states of the urine cannot be regarded as in any sense *local* diseases, but rather as expressions of constitutional morbid conditions, and so entirely is this the case with regard to one common pathological state of the urinary secretion, viz. *glycosuria*, that, as we have already said, we do not propose to consider it in this part. Yet, in many of these, the symptoms complained of, as well as certain of the pathological changes induced, are manifestly local, and we are only following a universally accepted classification in considering them as amongst urinary and renal diseases.

It should be borne in mind, in considering whether any particular specimen of urine is morbid or not, that, in different individuals, very great differences may be encountered in the amount of *water* secreted in the urine, so that its specific gravity may vary within very wide limits, from 1,005 to 1,030, consistently with health; and with this great variability in the amount of water secreted in the urine, there will be corresponding variations in the colour and in the capability of retaining in solution the urinary solids. A urine of high specific gravity (unless this depends on the presence of sugar) will be of darker colour, and more likely to deposit urates on cooling than a urine of lower density. Persons who perspire freely and lose much water by the skin, especially if they are in the habit of drinking sparingly of water, will often pass urine very dark in colour and of high specific gravity, and we should inquire into these habits before concluding that the urine is morbid. Those, on the other hand, who perspire but little and drink freely of water, or aërated waters, or of diuretic beverages, such as tea and coffee, will usually habitually pass an abundant quantity of pale urine of low specific gravity.

LITHIASIS; THE DEPOSITION OF URIC (OR LITHIC) ACID AND URATES IN THE URINE.

The deposition of *amorphous* **urates** is one of the commonest of occurrences in urine after it has been voided and on cooling. It is not inconsistent with perfect health, and may be determined simply by an unusually low temperature, or by active or severe exercise, or by excessive perspiration. It also frequently occurs in association with a variety of morbid states—some trivial, some grave, as in common colds or chills, in some dyspeptic conditions, in fevers, and in most wasting diseases. In fevers this deposition may be in part due to the excessive loss of water by the skin and lungs, owing to the high temperature and the quickened circulation.

The urine must always be *acid* for this deposition to take place. It only appears as the urine cools, and it again disappears on warming the urine. It is always more or less deeply coloured by urinary pigment.

The amorphous urates, as found in human urine, are, as Sir William Roberts's investigations have shown, *quadri-urates.* This is the special physiological combination of uric acid. When uric acid departs from this normal state of combination it is apt to give rise to morbid phenomena. *Free uric acid* is only met with in the human body as a *morbid* product, as a crystalline deposit in the urine, and as gravel and calculus in the urinary passages. *Bi-urates* are also pathological products; they occur as gouty concretions in the tissues, and their history will be considered in treating of gout.

These quadri-urates are very unstable. "In weak solutions of the alkaline carbonates or of the dimetallic phosphates they slowly take up an additional atom of base and are converted into bi-urates. On the other hand, in water, and in watery solutions of the neutral salts, they are split up into free uric acid and bi-urate."[*] Uric acid is extremely insoluble,[†] and when, in certain circumstances, the quadri-urates (of potash, soda, and ammonia) in human urine become decomposed in the urinary passages and uric acid is set free, it is deposited in the crystalline form and thus may give rise to the symptoms of gravel. This tendency may not, in other cases, be shown until after the urine is voided, when a copious deposit of characteristic crystals of uric acid takes place.[‡]

It may be of some importance to note that "all acid urines, if guarded against septic changes, deposit uric acid sooner or later," and if it were not for the presence of some inhibitory ingredients, which greatly retard the water of the urine from breaking up the quadri-urates, "uric acid would be thrown out daily in the urinary passages, and everyone would be subject to gravel." It would appear that the salts and the pigments are the chief of these inhibitory ingredients.

The preceding observations may assist us in elucidating the **etiology** of **uric-acid** gravel.

The poverty of the food in *saline* constituents may predispose to the precipitation of uric acid in the urinary passages. The comparative frequency of stone amongst the children of the poorer classes may thus be traced to their food, consisting chiefly of substances poor in mineral salts—as is the case with farinaceous substances—bread, oatmeal, and potatoes; whereas milk, meat, and fish, which enter so much more largely into the dietary of the children of the well-to-do, contain a far greater proportion of mineral salts. Stone is also very common in India, where rice forms the chief part of the diet of the natives—a food very poor in mineral constituents. In such cases the urine must also necessarily be poor in saline constituents. The freedom from gravel and stone which sailors are known to enjoy has been referred to the great quantity of salt they consume with their food. The tendency to precipitation of uric acid in chronic Bright's disease may be referred to the almost entire absence of pigment in the pale urine of low density passed in this disease.

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[*] Sir W. Roberts, "Uric Acid, Gravel, and Gout," p. 30.

[†] A gramme requires for its solution at ordinary temperatures 14 litres of water, and about half that amount at the temperature of the body.

[‡] These crystals look like grains of cayenne pepper; they are usually in the form of rhombs or prisms of a deep red colour, owing to staining with urinary pigments.

In another class of cases in which uric acid deposits are common, *i.e.* the over-fed, rich and indolent, the urine abounds in salts and in colouring matter, and another cause must be sought to explain this tendency; no doubt in these cases this precipitation is due to the excessive acidity of the urine and to the excessive quantity of uric acid in it. It has been experimentally established that the higher the percentage of uric acid in urine (out of the body) the more rapidly is the uric acid precipitated, and it has also been shown that the addition of a very minute quantity of an alkaline carbonate to normally acid urine postpones considerably the deposit of uric acid.

Sir Wm. Roberts's experiments justify the conclusion that "high acidity, poverty in salines, low pigmentation, and high percentage of uric acid" tend to accelerate the precipitation of uric acid, and that "depressed acidity, richness in salines, richness in pigments, and low percentage of uric acid" tend to retard precipitation. The most important of these factors appears to be the degree of acidity.

The **treatment** of uric acid deposits may be either preventive or curative. Much may be done by medical and hygienic treatment to limit the tendency to the deposition of uric acid in the urinary passages. But it is important not to associate too intimately the occurrence of uratic deposits in the urine with gout, as is sometimes done.

Sir William Roberts has well pointed out that although the two tendencies are often found together, they are also often found separately, and that while in gout the precipitation takes place in the blood and tissues, and the uric acid is deposited in the form of a chemical combination—sodium bi-urate;—in gravel the precipitation takes place, strictly speaking, outside the economy, in an excretion—the urine—while it is certainly still *in contact* with the urinary passages, and the uric acid is deposited in the *free*, not in a combined, state.

These tendencies own, undoubtedly, a close relationship, but they are not exactly identical; it is, however, quite possible that the same constitutional vice, modified by some other controlling influence which we do not understand, in the individual, determines in one a precipitation of free uric acid in the urine, and in another a deposit of sodium bi-urate in the tissues. It has been found that in districts where calculous disorders are common gout is of rare occurrence, and conversely, where gout is common calculous disorders may be infrequent.

These considerations are important from the point of view of therapeutics, as, in the case of uric acid gravel, it is to modifying the urinary excretion that our attention should, in a special manner, be directed.

As it has been shown that a deficiency of saline matters in the urine favours the tendency to deposition of uric acid, we should endeavour to supply this deficiency by suitably modifying the food of persons with this tendency. The free admixture of common salt with the food is one means of accomplishing this, and when the habitual food is found to be composed of substances poor in salines—as rice, potatoes, and farinaceous foods generally—we should endeavour to replace them by others rich in salts—as animal flesh, fish, eggs, milk, and fresh vegetables.

Although, in certain circumstances and in certain cases, precipitation of uric acid may occur in urine which contains *less* than the normal average of this ingredient, such an accident is of rare occurrence, and we may assume, as a basis for our therapeutic injunctions, that an excessive amount and a high percentage of uric acid in the urine, when other favouring conditions co-exist, greatly increase the tendency to the production of gravel. When such a condition of the urinary excretion exists some attempts should be made, by modification of the diet, to alter it.

It has been experimentally established that a reduction in the amount of albuminoids in the food is attended by a diminution in the excretion of uric acid, and an increase in the amount of albuminoids consumed is followed by an increase in the excretion of uric acid.* We should carefully inquire into the food habits of patients who suffer from uratic deposits, and we should limit the intake of animal albuminoids, such as butcher's-meat, game, the firmer and richer kinds of fish, eggs, cheese, etc., to the quantity actually necessary for the due nutrition of the body; as a fact, very many men, especially of the easy classes, consume an amount of animal albuminates largely in excess of the nutritive wants of the system, and this doubtless is one reason why they suffer so much more from this affection than temperate men of the labouring classes. Such persons should be urged to reduce the quantity of animal food which enters into their daily dietary, and replace it by consuming a larger proportion of farinaceous foods, of fresh vegetables and salads, and of fruit.

An **excessive acidity** of the urine is undoubtedly one of the most potent factors in causing the precipitation of uric acid, and our first and chief therapeutic effort should be to moderate or remove this excess. There is no more important fact to be borne in mind, in connection with this matter, than that *uric acid cannot be deposited from an alkaline urine*, and it cannot be deposited *prematurely* (*i.e. within* the urinary passages) even in urine that is neutral or feebly acid. In our endeavours to prevent this excess of acidity in the urine it may help us to remember certain facts that have been established with regard to this excretion. The taking of food lowers its acidity and augments its quantity; fasting has the opposite effect. It follows naturally that sleep has the same effect as fasting, and that it is followed by an increase in the acidity and a relative diminution in the amount of urine. It is therefore during sleep, and especially in the early morning, for an hour or two before breakfast, that there is the greatest risk of precipitation of uric acid in the urinary passages. During sleep many factors favour the deposition of uric acid; the urine secreted is relatively excessively acid, it is scanty, it is rich in urates, and owing to the complete repose of the body the renal stream is comparatively slow and stagnant. During the day opposite conditions prevail. Our protective measures then should be especially applied at bed-time, and in more intractable cases in the early morning also—or during the night if the patient is restless. These remedial indications are (1) to lessen the acidity of the urine and (2) to increase its dilution. In order to lessen the acidity of the urine alkalies must be given. For this purpose we prefer a mixture of 15 grains each of sodium and potassium bicarbonate, together with 5 grains of sodium chloride, dissolved in a breakfast-cupful of warm milk and water, about one-third milk and two-thirds water. This dose may be taken at bed-time and on waking in the morning, and during the night if restless and wakeful. In slight cases, and merely as a preventive, one such dose daily will suffice; in more decided cases two, or even three, should be given. Some use potassium citrate in doses of 40 to 60 grains dissolved in 3 or 4 ounces of water. We think the bicarbonates more effective, as they also relieve excessive gastric acidity, which is often present in these cases.

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* In health the daily amount of uric acid excreted depends much on the diet. With a vegetable diet, half a gramme; with an animal diet, as much as two grammes may be excreted.

It is, however, better to use the citrate if we give the dose *soon after* food, as we do not then desire to neutralise the acid gastric juice.

The advantage of milk and water as a vehicle, together with the addition of a few grains of chloride of sodium, is that it makes the mixture quite a pleasant drink, taking away the alkaline taste, and it is an efficient diuretic, and therefore promotes another most important indication, viz. the free dilution of the urine. We have found a few grains of sodium bicarbonate, when dissolved in a cupful of hot milk and water, rapidly produce a considerable diuretic effect with many persons. In very intractable cases a drink of this kind should also be ordered to be taken about an hour before lunch and dinner, in addition to the above night and morning alkaline draughts. The reaction of the urine should be frequently tested, and the alkaline doses should be diminished as soon as it is found safe to do so.*

Persons predisposed to uric-acid gravel should not allow too long intervals to occur between their meals. The usual effect of a meal is to render the urine for a time alkaline and to dilute it in proportion to the quantity of water consumed; *after* assimilation the urine again becomes acid and more concentrated. At the same time it must be remembered that it would be a serious error to urge such persons, when they suffer also from languid and slow digestion, to take another meal before the preceding one has been digested; that might simply have the effect of producing an acid dyspepsia, which would greatly aggravate the tendency to uratic deposits. If a light breakfast is taken at 8.30 a.m., the mid-day meal should follow at 1.30, and the evening meal not later than 7.30, while at 12 noon, at 5 p.m., and at bed-time, a tumblerful of milk (one-third) and potash or Vichy water (two-thirds) should be drunk.† This plan we consider far preferable to *frequent* feeding.

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* A specimen of freshly-voided urine should be set aside in a test-tube, kept warm to prevent the deposition of amorphous urates, and if precipitation is morbidly imminent crystals of uric acid will soon appear; if they do not appear for several hours precipitation is not morbidly imminent, and the antacid medication may be moderated or discontinued. (Sir W. Roberts, "Croonian Lectures.")

† Ten grains of potassium bicarbonate in a tumblerful of milk (one-third) and water (two-thirds) will do quite as well.

The object of alkaline treatment is not necessarily to render the urine alkaline, but to sufficiently diminish its acidity that the precipitation of uric acid may not occur within the urinary passages, where it becomes a source of danger, but be postponed until after the urine has been voided, when no harm can follow its deposit.

Another useful preventive of uric acid precipitation is the habitual consumption of an adequate quantity of pure **water** or of beverages which substantially have the same diluting effect on the urine. Sir William Roberts has pointed out that this may occasionally be "a two-edged weapon," and by diminishing the degree of pigmentation and the proportion of salines in the urine, it may certainly favour the deposition of uric acid. But we believe, and, indeed, Sir William Roberts admits, that such contingencies must be excessively rare; and we may conclude that, as a practical rule, the free consumption of pure water is altogether an advantage to persons subject to uratic deposits. It must not be trusted to alone, but, combined with the other means we have referred to, it is a valuable auxiliary.

Alkaline mineral springs, such as Vichy, which justly heads the list, Vals, Ems, Royat, Neuenahr, Apollinaris, etc., are of great value in the treatment of uric-acid gravel; they both dilute the urine and diminish its acidity, and, moreover, when drunk as they are at their sources in considerable quantity, they flush the urinary tracts and carry away concretions that may be already lodged there.

Of late years it has been the fashion to advocate the use of non-alkaline mineral waters in the treatment of uric-acid gravel, and altogether fanciful dangers attending the use of the alkaline springs* have been invoked or invented to enhance the reputation of those spas which have not the advantage of possessing such springs. Springs very feebly mineralised, such as *Evian*, or containing chiefly a little calcic sulphate, as those of *Contrexéville* and *Vittel*, in France, have been especially advocated. Undoubtedly uric acid concretions, even of considerable size, have been frequently found to be evacuated during and after a course of Contrexéville waters. In this resort *very large quantities* of the mineral springs are frequently prescribed, and we can scarcely doubt that it is mainly to the mechanical flushing of the urinary passages, by these large quantities of water, that the remedial effects are due.

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* Dujardin-Beaumetz, referring to this, observes that it was Trousseau who invented the "Alkaline Cachexia," and remarks that since that epoch the experimental method has shown that the alkalies promote and regulate nutrition rather than enfeeble the organism. ("Clinique Thérapeutique," vol. ii. p. 226.)

But, to quote again Sir William Roberts, "a preventive treatment should be available all the year round, and be capable of timely application whenever the emergency arises. I see no reason . . . . . why sufferers from this kind of gravel should not, by a prompt resort to antacid remedies, be able at all times to protect themselves effectually against fresh formation of uric acid concretions, and thereby save themselves from a world of pain and danger." *

A regular, free, daily evacuation of the bowels is most important in these cases, for, by promoting hepatic and intestinal excretion, we lessen the risks of excessive elimination of acid urates in the urine. A mild, aloetic pill at night, combined occasionally with half a grain of calomel and followed by a tumblerful of Carlsbad water in the morning, will be found most useful.

Regular, adequate exercise in the open air is advantageous, and should be recommended in most cases, with the view of promoting complete oxidation of nitrogenous waste into the soluble urea. We are not, however, in favour of prescribing very active physical exercise in *all* cases indiscriminately, as we may, by so doing, cause in some persons an increase in the excretion of acid urates from excessive nitrogenous metabolism, and in persons who perspire freely we may also produce a dangerous concentration of the urinary excretion in the urinary passages.

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* "Croonian Lectures," 1892, p. 70.

The excretory functions of the skin should be promoted by regular baths and by friction of the surface.

If dyspeptic symptoms co-exist, these must be dealt with in accordance with the principles already laid down in another chapter, more especially a great simplicity and moderation in the diet must be enforced. Alcoholic stimulants should be, if possible, entirely abandoned, or limited to a small quantity of hock or other similar light wine mixed with an alkaline water.

OXALURIA.

This term is applied to the continued or frequent presence in the urine of crystals of **oxalate of lime.** Their usual form—that of small, colourless, octahedral crystals—is well known and characteristic; as is also their occasional appearance in what has been termed the "dumb-bell" form. It has been estimated that in health about a grain and a half of oxalate of lime is passed daily in the urine.

The mode of origin of the oxalates has not been clearly ascertained. Lecorché and Dujardin-Beaumetz maintain that they are wholly due to the oxalic acid introduced into the stomach in vegetable substances. They regard the oxalates as the gravel of ill-nourished persons—the peasants and the poor who live almost entirely on vegetable food. They do not admit the existence of the so-called "oxalic diathesis," but look upon the appearance of oxalate of lime in the urine as altogether accidental. Esbach's researches, quoted by Dujardin-Beaumetz,* show what a vast number of common articles of food contain oxalic acid. Sorrel, spinach, rhubarb, are especially rich in it. It also occurs in cabbage, beet-root, haricots, tomatoes, celery, potatoes, and even bread; it is found in dry figs, in plums, gooseberries, strawberries, raspberries, oranges, lemons and cherries; it is present in considerable quantity in pepper, in black tea, and in cocoa, and, in less quantity, in coffee and chocolate. Many other less common articles of food are mentioned as containing it in minute quantity. It seems, therefore, very probable that the poor, who live much on vegetable food and who drink large quantities of tea, may introduce an excess of oxalates with their food, and so determine the deposition of oxalate of lime in the urine.

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* "Clinique Thérapeutique," vol. i. p. 231.

Some have suggested that it is derived from uric acid by a process of oxidation ; others that it originates from incomplete oxidation of starchy, saccharine and fatty foods, of which, however, there seems to be no kind of proof ; and others that it is due to changes in the mucus of the urinary passages, or to decomposition of uric acid by the action of certain ferments in the urine. Its appearance in the urine has been said to coincide with the development of a particular form of dyspepsia in ill-nourished, over-worked persons, accompanied by pain or weight across the loins, irritability of the bladder, great muscular languor, general debility, emaciation, nervousness and great depression of spirits. But these symptoms are apt to occur in persons who show no evidences of oxaluria, while the latter may be found in persons unaccompanied by any of these symptoms. However, the chief clinical significance of excess of oxalates in the urine is the risk of the deposition of crystals of oxalate of lime in the urinary passages and the formation of calculus. The precipitation of crystals of oxalate of lime, long after the urine has been passed, is not necessarily of any pathological significance, and may be simply the result of decomposition in the urine.

It is, perhaps, of some practical importance to know that these crystals are most frequently found in highly acid urine. They are said to be usually abundant in spermatorrhœa.

It will be seen that we have no very clear causal indications for **treatment** in these cases, except, it may be, to look carefully to the diet of such patients. Alimentary substances known to contain oxalic acid should be prohibited. The chief of these we have named. Tea should be especially avoided, and alcoholic drinks also. Bouchardat considers effervescing wines and waters particularly injurious. Milk appears to be well borne, and this may, therefore, be given freely. A good sound nourishing diet, composed of an adequate quantity of animal food of digestible quality and suitable preparation, is an important point to be insisted upon. Cantani found an exclusive meat diet freed the urine of oxalates.

Such general hygienic measures should also be enforced as are calculated to restore both mental and bodily health. Cold sponging, followed by friction of the skin, plenty of outdoor exercise, at the seaside or in mountain or country resorts, rest from fatiguing or exciting occupations, and, when possible, freedom from worry.

Co-existing dyspeptic conditions must be treated on the general principles already laid down. If there should be chronic gastro-intestinal catarrh, washing out the stomach daily has been advocated, or, as this may be objected to by many, a substitute may be found in drinking three-quarters of a pint of hot water, containing 2 or 3 teaspoonfuls of Carlsbad salts dissolved in it, about an hour or half an hour before breakfast every morning, and a tumblerful of Vals, Vichy or Apollinaris water at bed-time.

The bowels should be kept freely open by suitable aperients. There seems to be a general consent that nitro-hydrochloric acid is one of the most useful medicines in this malady, and 20 minims of the dilute acid, with some bitter infusion, may be given soon after food twice or thrice daily; we may often usefully combine with this 10 to 20 minims of tincture of nux vomica, or 3 or 4 minims of liquor strychninæ, or a grain or two of quinine may be added to each dose, or 5 to 10 grains of the citrate of iron and quinine. Although alkalies are not of the same use in these cases as in uric-acid gravel, still they are sometimes of service; and Sir William Roberts has seen good arise from small doses of potassium bicarbonate, and he has seen crystals of oxalate of lime disappear by rendering the urine freely alkaline; this is very likely to be the case where there is a mixed deposit of uric acid and oxalates. The main object of treatment is to restore the digestive and general tone.

PHOSPHATURIA.

There are two forms of phosphatic deposit which occur in *alkaline* urine. The first is of little clinical significance; it is a white deposit ("white gravel") of amorphous phosphate of lime thrown down when the alkalinity of the urine is due to *fixed* alkali; this precipitation, however, sometimes takes place in the bladder, and the phosphates are discharged at the end of micturition as a whitish fluid, which is sometimes mistaken for spermatorrhœa. This phosphate is often precipitated on heating urine. All these phosphatic deposits are distinguished by being dissolved by acetic acid. This form of phosphatic deposit very rarely leads to the formation of calculi, for the amorphous phosphate of lime has scarcely any tendency to form solid masses. It is not certain that the presence of this deposit in the urine ought to be regarded as evidence that it is excreted in excess. To prove that, it would be necessary to make a quantitative analysis of all the urine passed in twenty-four hours; nor is there any very direct evidence that *phosphatic* urine is a symptom of undue waste of the nervous tissues. However, we think there is some presumptive evidence to this effect. There are no *special* indications for the **treatment** of this form of urinary deposit: the morbid conditions, if any, with which it is found associated will present the true indications for treatment.

Habitually alkaline urine should be treated by general hygienic measures, suitable food, change of air and scene, moderate regular exercise and cheerful occupation. Mineral acids are of little direct value, but may assist usefully as general tonics.

It is different with regard to the phosphatic deposit determined in urine by *ammoniacal* fermentation of urea, as observed in cystitis, which appears to be due to the introduction of a **bacterial** ferment.

This is the *triple* or *ammonio-magnesian phosphate* found in decomposing urines. These phosphates are prone to concrete together and so form a considerable part of many calculi. Such calculi are usually formed in the bladder, and this deposit may even cover the mucous membrane of the bladder itself. The mode of entrance of the bacterial ferment into the bladder upon which this ammoniacal decomposition of urea depends is not always clear; it has undoubtedly been often introduced by the passage of catheters which are not clean and aseptic. Certainly stagnation of urine in the bladder favours this decomposition, and when once established, if the bladder cannot completely empty itself, there is always a residue of putrid urine to excite the same process in that afterwards secreted. If cystitis does not already exist, the presence of this ammoniacal urine in the bladder readily excites it, and pus becomes mixed with the excretion.

The *indications* for **treatment** in these cases are (1) to thoroughly cleanse the bladder of its decomposing contents and (2) to endeavour to prevent the further decomposition of the urine secreted.

(1) The bladder should be completely emptied of its contents by catheterisation when it is evident that micturition does not thoroughly empty it; but great care should always be taken when introducing a catheter into the urethra or bladder for any purpose, to see that it has been made thoroughly clean and aseptic. The bladder may then be washed out with a warm solution of borax and boric acid—weak solutions of chloral and of carbolic acid have also been used. For dissolving phosphatic deposits in the bladder a very dilute nitric acid injection may be employed—1 dram of dilute nitric acid in 10 ounces of warm water. (2) To prevent the further decomposition of the secretion anti-fermentive drugs must be given. Sodium salicylate or sodium benzoate, in 10- to 15-grain

doses 3 times a day, answers well. Whitla says he has found 8- to 10-grain doses of boric acid by the mouth of "surprising" efficacy. We have ourselves found salol very useful in these cases. Sir William Roberts has advocated drinking large quantities of fluid at regular intervals and encouraging regular micturition so as to keep the bladder washed out with the renal secretion. Buchu, santal, juniper, turpentine, resorcin, and many other drugs of this class, have been used by different physicians with more or less success.

HÆMATURIA.

Blood may appear in the urine in a variety of circumstances.

A frequent cause is the presence of a calculus in the kidney or urinary passages, producing laceration of the blood-vessels; when there is a small calculus in the kidney any jolting movements of the body, as in riding or driving, or any sudden jar, may determine the occurrence of hæmaturia. Blood may also be poured into the urinary passages from laceration of the kidney or rupture of blood-vessels in the urinary tract from external mechanical injury, as in falls on the back, railway accidents, etc. Hæmaturia from undue sexual excitement may be classed under this heading.

Congestive or inflammatory states of the kidney, bladder, or urethra, may also lead to the presence of blood in the urine, as in acute Bright's disease, cystitis, and gonorrhœa; embolic infarcts from ulcerative endocarditis, when lodged in the kidneys, also usually lead to the escape of blood with the urine.

New growths, such as cancer, and tubercle in the kidneys or bladder, and villous growths in the bladder, cause hæmaturia.

The so-called "endemic" hæmaturia which occurs in Egypt and elsewhere is *parasitic* in its nature, and attributable to the entrance into the blood-vessels of the *Bilharzia hæmatobia.*

Hæmaturia may also depend on some general morbid blood state, as in purpura, scurvy, malarial fever, small-pox, etc. There are also the toxic forms, dependent on the introduction into the blood of matters peculiarly irritating to the kidneys, as cantharides, turpentine, and, in some rare instances, quinine.

Finally, in some cases it may occur without the existence of any discoverable cause.

There can rarely be any difficulty in the detection of the presence of blood in the urine—in moderate or large hæmorrhages the colour is sufficiently characteristic; indeed, the urine often looks like pure blood; —in cases where there is but a scanty outpour the microscope or the guaiacum test may be applied.

It is often important to determine the **seat** of the hæmorrhage. It is as well to bear in mind that in women the blood may come from the uterus. If during micturition it can be observed that the flow of blood comes first and is followed by a clear stream of urine, then it is pretty clear the blood must come from the urethra. The presence of flat blood clots in the urine points to their formation in the floor of the bladder, while cylindrical casts of the ureters indicate a higher origin, and blood casts of the uriniferous tubules point to their formation in the renal cortex and to the probable existence of acute nephritis. If the blood is only passed at the end of micturition its source is commonly the bladder. When the blood comes from the pelvis of the kidney it is always intimately mixed with the urine.

A dark brownish colour of the urine has also been regarded as affording presumptive evidence of a renal origin of the blood, the blood corpuscles having been acted on by acid and their hæmoglobin converted into acid hæmatin. But in *profuse* hæmorrhage the acid is insufficient to produce this change. When the urine is pink or bright red this is due to alkaline reaction and the bladder is probably the seat of the bleeding.

Profuse hæmorrhage from the bladder, unaccompanied by other symptoms, is usually dependent on villous tumour or malignant growths.

Besides the presence of blood in the urine, we may have symptoms of renal colic from blood clot arrested in the ureters, or dysuria, from the presence of a large coagulum in the bladder.

After these preliminary etiological and other considerations, we may now pass on to consider the **treatment** of hæmaturia.

The indications are, first, to arrest the hæmorrhage, which may be in itself dangerous although very rarely fatal; and secondly, to remove the cause, which, however, may not be possible.

It should be remembered that drugs have been found to have less effect in this than in most other forms of visceral hæmorrhage.

When the bleeding is clearly due to the presence of renal calculus, absolute rest in the recumbent position, bland, cold, acidulous drinks, such as raspberry vinegar in iced water, or barley water with sliced lemon in it, or lemon whey, will usually suffice to arrest the milder forms. If, however, these measures are not adequate, we may give gallic acid in 5- to 10-grain doses, with 3 or 4 minims of dilute sulphuric acid in an ounce of cinnamon water every two or three hours. If there should also be pain and restlessness, we should add $\frac{1}{6}$ or $\frac{1}{4}$ grain of acetate of morphine to each dose.

Hypodermic injection of ergotin or of ergotinine is often an effectual remedy. Oil of santal and oil of turpentine, in capsules, are useful in certain cases when the bleeding is from the pelvis of the kidney, but they are contra-indicated in hæmorrhage from the cortex, as in acute nephritis. Hamamelis and hydrastis canadensis are commended by some. Acetate of lead and opium is an old and favourite remedy. In certain cases the tincture of perchloride of iron is one of our best resources. External applications may be occasionally of use, and ice-bags to the loins, when the hæmorrhage is from the kidneys, and to the hypogastric region when from the bladder, have been found useful. Dry-cupping to the loins in congestive or inflammatory cases is a good expedient, and if the bleeding should be traccable to a toxic irritant, like cantharides, warm fomentations may also be applied, together with the internal exhibition of aperients and *diaphoretics.* In this latter connection it may be mentioned that Whitla has found tincture of jaborandi, in half-dram doses, of great value "in most forms of renal hæmorrhage."

When the hæmorrhage is from the bladder, the injection of astringent solutions into this organ is indicated after as complete removal as possible of its contents. One of the best is a solution of alum, 2 grains to the ounce; or one of nitrate of silver, 10 grains to the pint; or of hazeline diluted with twice as much water; or of perchloride of iron, a dram to a pint. Another expedient is the injection of iced water into the rectum.

Hæmaturia occurring in the early stage of acute nephritis, or from acute congestive conditions, rarely needs any active interference for its arrest, beyond hot applications to the loins as already mentioned.

The causal indications would lead us into the consideration of the treatment of the several different diseases of which hæmaturia may be a symptom, which we may have occasion to do hereafter. Some of these, as cancer and tubercle, are obviously incurable.

HÆMOGLOBINURIA.

In this case the urine has the same aspect as in hæmaturia, but on microscopical examination no red blood corpuscles can be found in it, and the urine is reddened by the colouring matter, the hæmoglobin of the blood. The urine is usually of a dark red or chocolate-brown colour, although it may sometimes be merely pinkish. It commonly throws down a sediment of dark-brown lithates, and oxalate of lime crystals are also often deposited. It is believed that the hæmoglobin is set free in the blood before its excretion in the urine.

Three forms of hæmoglobinuria have been described: (1) *paroxysmal;* (2) *toxic;* and (3) an epidemic *infantile* hæmoglobinuria.

It is the first, or *paroxysmal*, form that chiefly concerns us now. This is a rare and a remarkable malady. The *causation* of this disease is often obscure, but in most cases the *exciting* cause, at any rate, appears to be exposure to *cold.* The attacks will often cease during the warm season and return in the cold season. A cold foot-bath has brought on an attack in a patient subject to them. Bodily or mental fatigue, especially when combined with cold, is provocative of attacks. It has been thought to be closely related to malaria, but this is doubted by Osler and others. It has been observed in association with syphilis, and in cases resembling Reynaud's disease. It is more common in men than women.

The attacks are often preceded by chilliness and languor, and coldness and blueness of the hands and feet. Sometimes there is pyrexia, but more frequently the temperature and the pulse are sub-normal. Jaundice is sometimes present. Pain across the loins is sometimes complained of. The hæmoglobinuria rarely lasts more than a day or two, and cases have been seen in which there were two or three attacks in a day, the urine becoming clear in the intervals.

It has been suggested that the disease originates in "an undue sensitiveness to cold on the part of certain of the red blood-discs" (*Fagge*), which then allow their hæmoglobin to escape into the blood serum.

The **treatment** of this affection mainly consists in protecting those who are subject to it from cold and fatigue, and especially from exposure to cold *when* fatigued. Residence in a warm climate in the winter is most desirable when practicable. During an attack, the patient should be put into a warm bed and given some hot soup. Pain in the back may be relieved by mustard poultices over the lumbar region and by extract of henbane, as recommended by Druitt, who suffered himself from this malady. The daily routine of life should be so arranged that the subject of these attacks should always be well nourished by suitable food and at suitably-arranged meal-times. He should never be exposed to any exhausting efforts, physical or mental. He should be very warmly clothed, and the hands and feet should be especially cared for in this respect.

Alcoholic drinks appear to be injurious; but a cup of hot beef-tea on waking in the morning has been said to prove an effectual preventive. *Quinine*, in full doses, has been found by some physicians to be capable of warding off the attacks; but in some cases it seems to be useless, even when taken in very large doses. Ammonium chloride, salicin, iron, and arsenic have each had their advocates. In syphilitic cases, potassium iodide and mercuric chloride have sometimes produced a cure.

The **toxic** form is caused by such poisons as produce rapid dissolution of the blood corpuscles, and it is only of interest to us now in order to set us on our guard as to the detection and removal of such causes. Large doses of potassium chlorate, carbolic acid, pyrogallic acid, arseniuretted hydrogen, carbon dioxide, naphthol, muscarin, and also the poisons of malaria, yellow fever, scarlet-fever, typhoid fever and syphilis, have all been found, at times, capable of producing hæmoglobinuria. Transfusion of blood from one mammal into another will sometimes be attended with this symptom.

CHYLURIA.

This term is applied to the presence in the urine of fat in a state of minute subdivision, giving it the appearance of milk.

The presence of chyle in the urine no doubt arises, in most cases from a communication becoming established between distended lymph vessels, connected with the lacteals of the small intestine, and some part of the urinary tract. It is usually regarded as dependent upon blocking of some of the lymphatics by the immature ova of the *filaria sanguinis hominis*, although Osler and others maintain that there is also a non-parasitic form, the pathological nature of which is unknown.

The prophylactic measures against the introduction of this parasite into the body, when living in countries where it is known to exist, consist in the adoption of the precaution, so commonly advocated, of not drinking water that has not been previously boiled, unless we are absolutely sure of its purity, and in thoroughly washing all raw vegetables before consumption with water that has been boiled. Whether the parasite can be destroyed in the blood-vessels seems doubtful. The inhalation of ether or some other volatile anæsthetic has been suggested, but to be successful it would probably have to be repeated frequently for a long period. Astringents have been given internally, and injected into the bladder, with the idea of closing the communication between the lymph-channels and the urinary passages, and some success is said to have attended their use. Bence Jones and Waters found gallic acid cause the disappearance of the chylous aspect of the urine; it has been given in doses varying from 30 to 130 grains daily. Nitrate of silver, acetate of lead, and mineral acids have also been used.

Thymol has been given, in doses of 1 increased to 2 grains, with success, and with the disappearance of *filaria* in a few weeks. A restoration of the urine to a normal condition has also been reported from the administration of the syrup of the iodide of iron in full doses for nine weeks.* Should the urine coagulate in the bladder, as it has been known to do occasionally, and so cause retention, as large a catheter should be passed as possible, fitted with an aspirating syringe, and the coagulum should be broken down by the alternate injection and withdrawal of a warm solution of sodium bicarbonate.

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* Hare's "System of Practical Therapeutics," vol. iii. p. 563.

ALBUMINURIA.

The occurrence of albumen in the urine, as a symptom of Bright's disease, will concern us when we are dealing with the treatment of that affection; at present we propose to limit our observations to the occurrence of albumen in the urine independently of the existence of any serious organic change in the kidneys. Nor are we now concerned about the albuminuria which occurs in the course of many acute infectious diseases, as in diphtheria and typhus, or in that which depends on passive engorgement of the kidneys from respiratory, circulatory, or mechanical obstructions, as in advanced pulmonary emphysema, cardiac disease, or abdominal tumours; nor in that which may be caused by overdoses of certain drugs. Albumen in the urine may occur in these and other morbid conditions without presenting any therapeutic indications; it is simply a symptom or accident of the disease with which it is associated, and it is only in this association that it can be profitably considered.

But albumen is occasionally found in the urine of persons **apparently healthy.** To this condition the terms "physiological," "functional," and "cyclic" albuminuria have been applied. All these terms are faulty; the term "*physiological*" rests on an assumption for which there is certainly no solid foundation; the term "*functional*" is an unsafe one, because it conveys an *opinion* instead of merely stating a fact; and the term "*cyclic*" implies a limitation of the circumstances in which it occurs inconsistent with recorded observations. After ten years of daily examination of candidates for life assurance, chiefly amongst the middle classes, of all ages from 17 to 70, we have exceedingly rarely, if ever, encountered albuminuria in a person who was in every respect in sound and vigorous health. It occasionally occurs in weedy young men who are indulging in habits inconsistent with their physique—either in athletic exercises beyond their natural capabilities, or in what is, for them, sexual excesses (although it might not be to their more robust companions); or they are consuming too much tobacco and lowering the cardiac tone. In schoolboys, and in other youths also, its occurrence may constantly be traced either to masturbation, to exposure to cold, or to excessive physical exertion. When it depends on diminished circulatory tone ("vascular asthenia" Sir William Gull used to term it) from physical exertion, it is remarkable how small an amount of exercise in some persons will determine it. We made some observations in the case of a gentleman who was accidentally discovered to have albuminuria on being examined for admission to a yeomanry regiment. In this case we demonstrated that it was not "cyclic," although it might be said to be "intermittent"; but it was always most manifest after his morning walk when he returned home to lunch; it was much less manifest on rising in the morning, *and after dinner*, at which he drank a pint of claret, it would entirely disappear. It was in connection with this case, which we saw with Sir William Gull, that he used the term we have quoted, "vascular asthenia"; when the circulatory tone was raised by rest and food and wine the albuminuria disappeared.

In other cases in which intermittent albuminuria has been observed, it appears to have been traceable to chill, to taking a cold bath or remaining too long in it, or exposing the surface of the body to cold air.

Whether over-feeding and dyspeptic conditions can of themselves produce albuminuria is a matter of doubt; that the occurrence of albumen in the urine, in the class of cases we are considering, is limited to the period of digestive activity is, we think, an erroneous conclusion.*

It is, of course, important, in connection with this matter, to remember that the urine may frequently be found to contain a trace of albumen from the presence of mucus or blood from other sources than the kidneys;

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* The relation of albuminuria to food is discussed in the author's work on "Food in Health and Disease," p. 432.

the admixture of a little prostatic fluid or urethral mucus in men, or vaginal discharges in women, will often cause urine to give this reaction. It is rare to obtain a specimen of urine from the female in which this is not the case. Of so-called "emotional" albuminuria we have no knowledge. Playing on wind instruments is said to have led to albuminuria in boys.

In connection with these cases we may note that Sir George Johnson has stated, as the result of his long and exceptional experience, that temporary albuminuria, even if apparently traceable to food, or over-exertion, or to chill, will, if neglected, lead, sooner or later, to persistent albuminuria and to fatal renal disease.

The successful **treatment** of these conditions depends on seeking out the cause and adopting measures to remove it. When it is due merely to anæmia or loss of tone, to "vascular asthenia," and occurs chiefly after exercise or exertion, it should be treated by general tonic measures.

Physical exercise should be limited to such only as is necessary to health; gentle walking or riding exercise may be permitted, always stopping short of any fatigue. It is, therefore, better to recommend that the daily exercise should be taken in repeated short walks or rides rather than in one or two long ones, and that the exercise should be taken, not in the early or late hours of the day, but chiefly in the afternoon, an hour or so after the mid-day meal. The food should be light but nutritious, and contain a due amount of digestible animal food. There is no need, nor is it desirable, to exclude animal albuminates from the dietary. Some sound Burgundy or other suitable wine may be taken at meals, diluted with a little water.

As a tonic, a combination of iron, quinine and strychnine is most useful; we are in the habit of prescribing 10 to 20 minims of the tincture of the perchloride of iron, 1 to 3 grains of sulphate of quinine, and 3 to 5 minims of the solution of strychnine in an ounce of chloroform water thrice daily, about two hours after a meal.

In cases in which there is reason to believe that the albumen is dependent upon a dyspeptic state, with a tendency to hepatic congestion from overfeeding or too great a consumption of animal food, then we should counsel a more liberal use of vegetable food, together with milk, and we should forbid eggs, and limit the nitrogenous food taken to a little fish or white meat. At the same time the bowels should be kept freely open by some saline aperient, such as Carlsbad salts, 2 or 3 teaspoonfuls in a tumblerful of warm water, taken in the morning fasting. The action of the skin should be promoted by hot or Turkish baths, with free friction of the surface. A certain amount of regular, moderate exercise should also be enjoined.

If the albuminuria should appear to be due, as has been suggested it may be in dyspeptic persons, to the irritation of the urinary mucous membrane by crystals of oxalate of lime or uric acid, the free ingestion of hot water, containing some alkaline salt in solution, should be ordered. A claret-glass of warm Vichy water may be taken half an hour before each meal and at bed-time; or, what answers as well, a glass of warm water, containing 10 or 15 grains of potassium bicarbonate in solution, and made to effervesce with a teaspoonful of lemon-juice.

Co-existing dyspeptic symptoms must, of course, be treated in the ordinary way.

For the albuminuria observed in schoolboys and adolescents, we would counsel a careful inquiry into habits, with the view of correcting any vicious tendency that may possibly be found to exist; we should forbid all athletic exercises for a time, and restrict the diet chiefly to milk and vegetable food; we should inquire if any digestive troubles exist, and especially if there has been any inattention to the action of the bowels. School tasks should be light, and mental and physical rest insisted upon.

The cases that are traceable to exposure to cold suggest the insistance on warm clothing, and avoidance of cold baths and cold bedrooms, and standing about during out-door games, or other out-door pursuits, in cold weather.

Moderate doses of antipyrin have been suggested for "neurotic albuminuria," but, as we are not prepared to recognise this as a distinct form of albuminuria, we hesitate to recommend it.

Albuminuria in a child having an elongated prepuce has been relieved by circumcision. Whatever other measures may be desirable in the treatment of albuminuria will be considered in connection with that of the several forms of Bright's disease.

ADDITIONAL FORMULÆ.

For lithiasis.

℞ Lithii boratis, 15 grains.
Sodii bicarbonatis, 18 grains.
Syrupi aurantii, 2 oz.
Aquæ effervescent. ad 12 oz.

M. A half to a quarter to be taken at a time. (*Dujardin-Beaumetz.*)

Another.

℞ Lithii citratis, 10 grains.
Acidi citrici, 20 grains.
Syrup. aurantii, ½ dram.
Aquæ ad 2 oz.

M. To be taken in effervescence with 14 grains of sodium bicarbonate dissolved in 2 oz. of water. (*Guy.*)

Pills for lithiasis.

℞ Sodii carb. exsic., 45 grains.
Extr. gentianæ, 45 grains.
Saponis hisp., 45 grains.
Pulv. zingiberis, 45 grains.

M. et divide in pil. 100. Five to ten daily. (*Ewald.*)

Mixture for the same.

℞ Liq. potassæ, 2 drams.
Tinct. serpentariæ, 1 oz.
Syrup. zingiberis, ½ oz.
Infusi serpentariæ ad 12 oz.

M. f. mist. Three tablespoonfuls twice a day. (*Paris.*)

Another.

℞ Sodii bicarb., 1½ dram.
Acidi benzoici, 40 grains.
Sodii phosphatis, 3 drams.
Tinct. hyoscyami, 4 drams.
Aquæ cinnam., 8 oz.
Aquæ ad 12 oz.

M. f. mist. Two tablespoonfuls three times a day. (*G. Bird.*)

For phosphaturia.

℞ Potassii bromidi, 2½ drams.
Sodii salicyl., 75 grains.

M. et divide in pulv. 6. One or two daily in half a glass of sweetened water. (*Ultzmann.*)

Or

℞ Acid. hydrochlor. dilut., 1 oz.

Fifteen drops three times a day in water. (*Ultzmann.*)

In oxaluria with debility.

℞ Acid. nitrici dil., 5 minims.
Acid. hydrochlor. dil., 5 minims.
Infusi serpentariæ, 1 oz.

M. f. haust. To be taken three times a day. (*G. Bird.*)

Mixture and pills for oxaluria.

℞ Acidi nitrici, 1 dram.
Acidi hydrochlorici, 3 drams.
Aquæ camphoræ ad 4 oz.

M. f. mist. A teaspoonful in a wineglassful of infusion of camomile three times a day.

℞ Pil. hydrargyri subchloridi comp., 5 grains.

F. pil. To be taken every night. (*G. Bird.*)

Bitter tonic in lithuria.

℞ Acidi nitrici diluti, ½ oz.
Tinct. gentianæ comp. ad 4 oz.

M. Two teaspoonfuls in water before each meal.
(*Prof. A. H. Smith.*)

For lithiasis.

℞ Potassii bicarb., 1½ oz.
Acidi citrici, 1 oz.
Aquæ, 12 oz.

M. f. mist. Two tablespoonfuls with twice as much water for a dose. (*Picard.*)

For hæmaturia.

℞ Acidi gallici, 10 grains.
Acid. sulph. dil., 10 minims.
Aquæ, 1 oz.

M. f. haust. For one dose.
(*Brinton.*)

For hæmaturia.

℞ Olei terebinthinæ, 1 dram.
Acidi sulphurici, dil., 1 dram.
Acidi gallici, 30 grains.
Mucilag. acaciæ, ½ oz.
Aquæ, 1 oz.

M. f. mist. A dessertspoonful every three hours.
(*S. D. Gross.*)

For hæmaturia.

℞ Ergotini, 15 grains.
Pulv. acaciæ, 30 grains.

M. et divide in pulv. 6. A powder every three hours.
(*Ultzmann.*)

Or

℞ Liquor. ferri perchlor., 1½ dram.
Aquæ camellæ, 6 oz.

M. f. mist. A tablespoonful every hour. (*Ultzmann.*)

Or

℞ Extracti ergotæ fluid., 14 minims.
Acidi gallici, 10 grains.
Aquæ cassiæ ad 1 oz.

M. f. haust. For one dose.
(*Fenwick.*)

For hypodermic injection in hæmaturia.

℞ Ergotini, 45 grains.
Glycerini, 2 drams.
Aquæ ad ½ oz.

M. Twenty minims to be injected thrice a day.
(*Ultzmann.*)

CHAPTER II.

THE TREATMENT OF RENAL CALCULI AND THEIR CONSEQUENCES—HYDRONEPHROSIS—PYURIA—PYELITIS CYSTITIS.

The occurrence of *Renal Sand* or *Gravel*—Composition of Renal Calculi—Causation of Calculi—Symptoms of Renal Calculus.

RENAL COLIC. *Indications for Treatment*—In the *Paroxysms*—Morphine Hypodermically — Chloroform Inhalations — Hot Drinks—Hot Baths—Enemata of Chloral, or of Opium and Belladonna—*In the Intervals*—Courses of Mineral Waters —Solvent Treatment—Surgical Treatment.

HYDRONEPHROSIS. Causes—*Treatment.*

PYURIA AND PYELITIS. Causes—Symptoms—" Pyonephrosis"—Perinephritic Abscess—*Treatment*—Cases of *Cystitis.* Additional Formulæ.

As the most common cause of pyelitis, and of the presence of *pus* in the urine, is the existence of **renal calculus,** it will be convenient to consider, in the first place, the treatment of renal calculi and their consequences, so far as they, directly or indirectly, concern the physician.

We have already seen, in considering the subject of the occurrence of certain crystalline deposits in the urine, that the chief danger in the tendency to these depositions is, lest they should occur in the urinary passages and form calculi. It is to the deposition of certain of the solid constituents of the urine, as concretions within the pelvis and calyces of the kidneys, and the symptoms and conditions arising therefrom, and the best methods of treating such states, that our attention must now be directed.

Such concretions occur in various forms; they may simply appear as small, gritty particles, as mere grains of *uric acid*, or they may be of the size of coarse sand, and such collections of *renal sand* or gravel may be passed with the urine, again and again, without giving rise to any serious symptoms, as the individual particles are not large enough to be arrested in their passage along the urinary tracts.

But larger concretions also form, varying greatly in size, and the largest are apt to remain in the pelvis of the kidney, and give rise to serious symptoms from their presence there, and others may (and this is especially the case with the smaller concretions) pass into the ureters, and, during their passage along those ducts, give rise to agonising attacks of **renal colic.** Such small concretions may be numerous, and then they are often rounded and smooth, and patients will be found to pass considerable numbers of such small rounded calculi again and again. Single calculi are, perhaps, more apt to be angular and irregular, having the aspect of an agglomeration of crystals, and these, doubtless, give rise to the severest attacks of pain in their passage. In some rare cases calculi of large size form in the pelvis of the kidney, and become moulded, as it were, to its cavity and project also into the ureter and block it.

Renal calculi are most commonly composed of *uric acid* mixed with urates; these are of a light reddish or fawn colour, and have usually a smooth surface; others are composed of *oxalate of lime* and uric acid; they are of very dark colour and rough surface (hence termed "*mulberry* calculi"). Phosphatic calculi are rare in the kidney; they are usually formed in the bladder, the phosphates being deposited around a nucleus of uric acid or oxalate of lime. We have already considered the conditions which lead to the precipitation of these deposits in the urine.

It is important to remember that in patients who pass *acid* urine, the only concretions likely to be met with are those which depend for their formation on the deposition of uric acid or oxalate of lime, and that phosphatic calculi are usually associated with the occurrence of alkaline urine, and occur as a deposition upon a pre-existing nucleus of uric acid or oxalate of lime.

It is, therefore, against the precipitation of these substances that protection is needed.

It is difficult in many cases to offer a satisfactory account of the origin of calculi. It has been suggested that drinking "hard" water—water saturated with lime salts—favours their occurrence, and no doubt such water cannot so well perform its solvent functions within the body as water which is quite pure.

For further considerations on the etiology of such deposits, we must refer to what we have already said under lithiasis and oxaluria.

The symptoms and common consequences of renal calculus are the following: (1) pain in the loins; (2) hæmaturia; (3) renal colic; (4) hydronephrosis from obstruction of ureter; (5) pyelitis. Hæmaturia and its treatment we have already considered. *Pain in the back*, when not associated with other symptoms of renal colic, and when not attended with hæmaturia, is sometimes, perhaps rather vaguely, referred to renal irritation from highly acid urine, or from some crystalline deposit in the pelvis of the kidneys, and if this "lumbago" is found to coincide with the passage of highly acid urine freely depositing lithates, and if it is found to be relieved by the administration of alkalies, this view of its causation may be correct. At any rate no harm can arise from treating this symptom, when accompanied by such urine as we have described, by the free exhibition of dilute alkaline drinks.

One of the most serious and painful consequences attending the existence of renal calculi are attacks of

RENAL COLIC.

An attack of renal colic is produced by the entrance of an urinary concretion into the ureter. Its onset is frequently sudden and violent, and the pain is often most agonising. It may occur when the patient is at rest, or it may be induced by some jarring movement or muscular effort. The pain usually starts from one loin, and extends downwards along the course of the ureter; it may radiate more widely over the abdomen, and is sometimes felt chiefly in the iliac region; it commonly shoots into the corresponding testicle, which is often retracted and tender, and the pain may be felt along the inner side of the thigh. The intensity of the suffering causes the patient to turn deadly pale, and drops of perspiration break out on his forehead. There is also often a feeling of chilliness, almost amounting to a rigor, the pulse is small and feeble, the breathing hurried, and the temperature sometimes rises; nausea and vomiting frequently, but not always, accompany the attack. The patient often adopts strange positions to relieve his sufferings. Some cessation of pain may occur from time to time throughout the paroxysm, but it returns again and again, until after a variable duration the paroxysm may suddenly cease with the escape of the stone into the bladder. The amount of suffering probably depends greatly on the form of the calculus and the character of its surface rather than on its size; a smooth, round, uric-acid calculus may give far less pain in passing along the ureter, although twice or three times the size, than one of oxalate of lime with a rough uneven surface. The urine, which is usually passed frequently and with pain, often contains blood.

Recurrent attacks of this kind are sometimes encountered, without any evidence that a calculus has passed from the kidneys into the bladder; in such cases it is probable there is a stone in the pelvis of the kidney, which from time to time passes into the upper part of the ureter, but being of too large a size to pass through that conduit, falls back again into the pelvis of the kidney. The passage of a clot of blood along the ureter may also give rise to an attack of renal colic. If the calculus remains in the kidney it usually gives rise to characteristic symptoms, of which *pain* in the back of a dull, wearing nature is the most constant; it is commonly referred to the affected side, and is usually accompanied by hæmaturia or pyuria.

The indications for **treatment** in cases of renal colic *during the paroxysm* are: (1) to allay pain and spasm; and (2) to further the passage of the calculus along the ureter, by flushing the kidneys with bland, diluent, mildly alkaline drinks; (3) and *in the intervals* to prevent the formation of fresh concretions and to promote the solution or painless discharge of those that remain.

The hypodermic injection of morphine ($\frac{1}{4}$ of a grain) with atropine ($\frac{1}{100}$ of a grain), every hour or two for three or four doses until relieved, is the best means at our disposal for the relief of pain and spasm. In slight cases, if seen at the onset, one injection will often be sufficient to induce sleep, and the patient will not infrequently wake up free from pain; but in recurrent or severe cases larger and repeated doses will be necessary. Some alcoholic stimulant should, at the same time, be administered when these large doses of morphine are used. Before administering the injection, let the patient drink 8 to 16 ounces of hot water or hot milk and water, with 20 grains of sodium or potassium bicarbonate dissolved in it, and give him a like draught on waking.

In cases where morphine or opium is counter-indicated, as in most cases complicated with Bright's disease, we must have recourse to inhalations of chloroform or ether. In the less severe cases, Professor Andrew H. Smith has found phenacetin, in 7- to 10-grain doses, adequate to relieve the pain. The hot bath, which is so highly extolled by some physicians for the relief of the spasm, should be employed as an auxiliary in protracted attacks, but it cannot take the place of morphine or chloroform. The same may be said of hot poultices and fomentations. If for any reason it should seem desirable to administer remedies by the rectum, solution of chloral, or of opium and belladonna, may be administered in the form of small enemata.

For the purpose of flushing the urinary passages and diluting the urine, the patient should drink freely of barley water, or of equal parts of hot milk and Vichy water, or of the mixture mentioned above, or of a mixture of equal parts of lemonade and potash water at choice.

Inversion of the patient is said to have been occasionally attended by immediate cessation of pain.

Highly important also is the **treatment in the intervals** with the view of preventing the formation of fresh concretions, and of dissolving or promoting the painless discharge of such as may remain in the kidneys.

It is for this purpose that patients who suffer from renal colic are sent to drink mineral waters at Vichy or Ems, or at Contrexéville, Vittel, or Evian. The former are alkaline waters, the latter are waters which, we believe, act chiefly mechanically and by their diluent quality. The latter are usually administered in very large quantities when it is desired to procure the expulsion of calculi from the pelvis of the kidney.

Patients at either of these spas will often be found to pass numerous small uric-acid concretions, in some cases year after year, and not infrequently concretions also of considerable size are got rid of; this is especially the case at Contrexéville.

There is some difference of opinion as to the possibility of exerting any solvent action on urinary concretions within the body. Sir William Roberts believes that this is possible, in the case of uric-acid concretions (as uric acid is soluble in alkaline solutions), if we give alkaline drinks in sufficient quantity and for a sufficient length of time. The urine must be kept continuously alkaline for long periods. In order to effect this, he prescribes the following mixture :—

℞ Potassii bicarb.		10 drams.
Acidi citrici		7 ,,
Aquæ destill.	ad	10 oz.

M.f. mist.

From half an ounce to an ounce of this mixture (equal to 60 grains of potassium citrate) should be given in a claret-glass of water every three hours for several months. Potassium acetate seems to agree better with some patients. The reaction and density of the urine should be frequently tested, especially the morning urine, which is most prone to become acid. The density should be kept low by increasing, when needful, the intake of water.

The diet should be carefully regulated on the lines already laid down in treating of lithiasis.

When there is clear evidence of the presence of a stone impacted in the kidney, and giving rise to painful and exhausting symptoms which are otherwise irremediable, surgical measures must be resorted to for its removal.*

HYDRONEPHROSIS.

This term is applied to an accumulation of fluid in the ureter and pelvis of the kidney, due to obstruction in the former, and it may, therefore, be caused by the impaction of a renal calculus in the ureter. Obviously other pathological conditions may lead to obstruction of the ureter, such as stricture from cicatrisation of an ulcer of its mucous lining, or external compression from whatever cause. Moreover, bilateral hydronephrosis may arise from compression or obstruction of both ureters, or from obstruction lower down and dependent on urethral stricture, prostatic enlargement, or disease of the bladder itself.

But the most common cause of unilateral hydronephrosis is impacted renal calculus; and in such cases, if the obstruction is complete, the distension of the kidney and atrophy of its substance may reach an extreme degree, so that it is finally converted into an enormous cyst, which is apparent as a large tumour in the region of the kidney. Such a tumour may occasion some difficulty in diagnosis, and in the female especially may be mistaken for an ovarian cyst. Aspiration of a portion of the fluid may remove the difficulty, as the fluid from a hydronephritic cyst contains some of the constituents of urine, such as urea and uric acid.

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* These are fully described in Mr. Treves's "Operative Surgery," vol. ii. pp. 481 *et seqq.*

There are rare instances of *intermittent* hydronephrosis in which, after the discharge by the urethra of a large quantity of clear fluid, the tumour suddenly disappears. After a time the sac refills, and the tumour reappears. These are the most hopeful cases, since it is clear, whatever may be the nature of the obstruction, it is not insurmountable. It may be also as well to remember that the sac will sometimes discharge itself spontaneously through the ureter, and the fluid never re-accumulate.

In bilateral cases, or in the event of the ureter on the sound side becoming blocked by a calculus, uræmia may supervene.

Many other points of pathological interest, associated with the development and history of these hydronephrotic cysts, do not concern us here, and we must now limit ourselves to a consideration of such **therapeutic** measures as they call for.

Unilateral hydronephrosis is rarely of itself fatal, and spontaneous cure is not unknown, and we should, therefore, not advise active interference until the patient is unable to bear the pain and inconvenience it causes. The intermittent cases should certainly be left alone.

Manipulation and compression of the tumour through the abdominal wall have occasionally led to its dispersion. Such manipulations should, however, be practised with very great care, lest rupture of the sac should be produced.

But when the sac is tense and painful it is best to puncture with a fine trocar, and aspirate, and withdraw the whole of the fluid. The best place for puncture on the *left* side is just in front of the last intercostal space. But on the *right* side it is advisable, in order to avoid the risk of wounding the liver, to puncture lower down—a spot midway between the last rib and the iliac spine, and about two inches behind the latter, may be selected. The sac is prone to refill, and repeated puncture may be needful; cases are on record of permanent shrinking after several tappings.

It is supposed either that the fluid does not re-accumulate, because of the destruction of the whole of the secreting structure of the kidney, or that the tapping removes pressure and irritation, and, as a consequence, the impacted calculus is set free and the obstruction is removed.

Incision and drainage, and, as a last resource, nephrectomy, have also been resorted to.

PYURIA (*pus in the urine*) AND PYELITIS.

The occurrence of *pus* in the urine is often the consequence of suppurative pyelitis, set up by irritation of the mucous membrane of the pelvis of the kidney by the presence there of a renal calculus. This suppurative inflammation may pass downwards along the ureter and reach the bladder. Or the order may be inverted, and suppurative pyelitis may be, and often is, the result of a propagation of suppurative inflammation from the bladder (cystitis), or the prostate (prostatitis), or the urethra (gonorrhœa). A slight catarrhal form, the result of chill, or a manifestation of the rheumatic diathesis, is also recognised by some physicians.

Nephritis, provoked by the administration of cantharides or turpentine or other renal irritants, is a very rare cause of pyuria.

Tuberculous disease of the kidney usually gives rise to pus in the urine; and pus in the urine may occasionally depend on the rupture of an abscess of adjacent parts into the urinary *passages*.

The following are the common *symptoms* of calculous pyelitis: pain in the region of the kidney, especially on the diseased side; pus, and sometimes blood, in the urine; fever of a hectic or remittent or intermittent type, often accompanied by periodical rigors; diarrhœa or constipation may prevail. Should any obstruction arise to the free discharge of the pus, it may, as in hydronephrosis, accumulate in the pelvis of the kidney, and cause great distension of this organ and the appearance of an abdominal tumour, "*pyonephrosis.*" Such a condition may occasionally terminate favourably, after a certain period, by subsidence of the inflammation, and a shrinking and drying up of the kidney into a putty-like mass. But the prognosis is not usually favourable, and one of the most unfavourable results is the formation of a *perinephritic abscess*, dependent generally on ulceration and perforation of the mucous membrane and the escape of pus and urine into the adjacent connective tissue. The perinephritic abscess may point and burst and discharge in the loin, or it may burrow in various directions.

The **treatment** of pyuria must, of course, depend on its causes. When pus in the urine is due to calculous pyelitis it can only be cured by the removal of the cause, viz. the calculus in the kidney, and the same methods already referred to for the promotion of the solution, or removal, of renal calculi must be applied. If the calculus is composed of uric acid, the alkaline treatment already described, together with an exclusive milk diet, or a diet almost exclusively confined to milk and the lightest of foods, or a course of mineral waters at Vichy or Contrexéville, may be attended by satisfactory results. If the calculus should be composed chiefly of oxalate of lime, solution cannot be looked for; but if it is not of large size, the discharge of such a stone, during treatment at Contrexéville, is by no means an uncommon event. If a tumour forms in the loins, or should the patient's sufferings be great and otherwise irremediable, surgical interference is called for.

In the slighter cases of catarrhal or *rheumatic* pyelitis, warm baths, confinement to bed for a few days, and warm bland alkaline drinks, the avoidance of all possible irritants in the food, of which milk and its preparations are the most suitable, and the administration of anti-rheumatic medicines, such as salines and the alkalies, will usually remove the symptoms complained of.

If the symptoms do not immediately yield, and pus in small amount continues to appear in the urine, some benefit may usually be derived from the administration of uva ursi, buchu, or pareira brava. Should the case tend to become chronic, the use of balsamic stimulants is indicated, such as oil of santal wood, copaiba, juniper, turpentine, etc. The latter drug, though irritant in large doses, is often very useful in small doses in cases of chronic suppuration of the urinary tract. Wood recommends that it should be given in emulsion, in doses of 10 to 15 minims, mixed with a dram of glycerine and 1 or 2 drops of oil of wintergreen to cover its taste. Dujardin-Beaumetz recommends that it should be combined with extract of cinchona, and given in pills at breakfast and dinner.

When suppuration is profuse it has been found advantageous to administer astringents by the mouth. Ultzmann has recommended tannin, tannate of quinine and alum. The latter is given in the form of *alum-whey*, of which a pint is taken daily—45 grains of alum being added to every pint of whey. Or 15 grains either of tannin or of tannate of quinine may be given, mixed with a few grains of sugar in a cachet, thrice daily. The bowels must be regulated by an aloetic pill at night or a dose of sodium sulphate in the morning.

Warm baths, hot fomentations, dry cupping to the lumbar regions are all comforting expedients; local congestions are relieved and a relaxing effect is believed to be produced on the muscular fibres of the ureters.

The symptoms attending pyelitis have been observed to be aggravated in women during the catamenial period. In such cases rest in bed should be enjoined, a combination of bromides and hyoscyamus administered, and frequent hot vaginal douches, for their revulsive effect, applied. When the presence of pus in the urine is dependent upon **cystitis**, or when pyelitis is complicated with cystitis, and the urine becomes alkaline or ammoniacal, then the administration of alkalies is unsuitable. It is by no means easy to render alkaline urine *acid*—the use of mineral acids by the mouth has no effect. Professor Andrew

H. Smith states that he has found saccharin among the organic acids the most efficient for the purpose of acidifying the urine. It not only acts on the urine as an acid, but also as a powerful antiseptic. He gives it in 2- to 3-grain doses in capsules three times a day. Benzoic acid is given for the same purpose, as it appears in the urine as hippuric acid. The dose is 10 to 15 grains thrice daily. Whitla commends very strongly the use of boric acid in these cases, in 5- to 15-grain doses three times a day. It is best given in a tumblerful of warm milk and water. We have also found salol very useful; one or two 5-grain tabloids may be taken every three or four hours.

Capsules of creasote or of eucalyptol (1 to 3 drops), taken with half a tumblerful of milk, or milk and water, four or five times a day, may also be found of value in preventing alkaline fermentation of the urine in the bladder. In some cases full doses of quinine and perchloride of iron are most useful.

The daily use of the catheter and washing out the bladder with boric acid solution is needful in most cases of chronic cystitis.

ADDITIONAL FORMULÆ.

For cystitis.

℞ Terebinthinæ pur., 45 grains.
Extr. gentianæ, 45 grains.

M. et div. in pil. 30. A pill three times a day, followed by two tablespoonfuls of lime water in milk.

(*Prof. Neumann.*)

For calculous pyelitis (uric acid or oxalate of lime).

℞ Sodii phosphatis, 1 oz.
Sodii bicarbonatis, 2 oz.
Lithii carbonat., 2½ drams.

M. f. pulv. A teaspoonful in a pint of water three times a day. (*Ultzmann.*)

Pills for cystitis.

℞ Terebinthinæ (Venice), 1 dr.
Castorei, ½ dram.
Camphoræ, 1 dram.
Magnesiæ calcin., q.s.

M. et div. in pil. 40. Three or four daily.

(*Dujardin-Beaumetz.*)

In chronic cystitis.

℞ Fol. buchu, 2 drams.
Fol. uvæ ursi, 2 drams.
Aquæ ferventis, 6 oz.

Macerate for two hours, strain, and add

Liq. potassæ, 1 dram.
Tinct. cinnamomi, 3 drams.
Tinct. hyoscyami, 3 drams.

M. f. mist. Two tablespoonfuls three times a day.

(*Druitt.*)

For cystitis.

℞ Sodii bicarbonat., 75 grains.
Dec. uvæ ursi, 6 oz.

M. f. mist. A tablespoonful every two hours.
(*Prof. Albert, Vienna.*)

For washing out the bladder.

℞ Resorcini, 15 grains.
Aquæ, 3 oz.

F. lotio. To be used twice daily.

Or,

℞ Alumenis, $\frac{1}{2}$ oz.
Zinci sulphatis, $\frac{1}{2}$ oz.
Acidi carbolici, $\frac{1}{2}$ oz.
Aquæ destill. ad 10 oz.

M. f. lotio. To be mixed with ten times as much water, and about a pint of the mixture to be injected daily into the bladder. (*Albert.*)

Powders for acute cystitis.

℞ Lupulini, 15 grains.
Morphinæ hydrochlor., $\frac{3}{4}$ gr.
Sacchari alb., 45 grains.

M. et divide in pulv. 8. Three to five daily. (*Prof. Ultzmann.*)

Or,

℞ Extr. aloes aquosi, 9 grains.
Morphinæ hydrochlor., $\frac{3}{4}$ gr.
Sacchari alb., 30 grains.

M. et divide in pulv. 8. One twice a day. (*Ultzmann.*)

For washing out the bladder in chronic cystitis.

℞ Acidi borici, $\frac{1}{2}$ oz.
Glycerini, 1 oz.
Aquæ destill. ad 10 oz.

M. f. lotio. To be mixed with an equal quantity of warm water. (*Ultzmann.*)

If the catarrh is putrid and offensive.

℞ Resorcini, 45 to 75 grains.
Aquæ destill., 3 oz.

M. f. lotio. (*Ultzmann.*)

For the solution of phosphatic deposits in the bladder.

℞ Acid. hydrochlor. fort., 3 minims.
Aquæ destill., 6 oz.

M. f. lotio. (*Ultzmann.*)

For chronic pyelitis.

℞ Quininæ tannatis, 15 grains.
Sacchari alb., 30 grains.

M. et div. in pulv. 6. One three times a day. (*Ultzmann.*)

For cystitis.

℞ Acidi benzoici, 75 grains.
Syrupi aurantii, 5 drams.
Aquæ destill. ad 10 oz.

M. f. mist. A tablespoonful every two hours. (*Neumann.*)

CHAPTER III.

THE TREATMENT OF INFLAMMATORY DISEASES OF THE KIDNEYS—ACUTE AND CHRONIC BRIGHT'S DISEASE.

ACUTE BRIGHT'S DISEASE.—ACUTE NEPHRITIS—Causes—Nature—Symptoms—Changes in the Urine—Increased Arterial Tension—Effusions into Serous Cavities—Uræmia—*Indications for Treatment*—Advantages of Milk Diet—Dilute Alkaline Drinks—Local Measures—Stimulation of the Skin by Hot Baths, or Hot Air or Vapour Baths, or the Wet Pack—Diaphoretics — Pilocarpine — Purgatives — Diuretics — Nitro-Glycerine—Diuretin—Treatment of certain Symptoms—Of Vomiting, of Dropsy, of Uræmia, of Cardiac Debility and Anæmia—Treatment of Convalescence.

CHRONIC BRIGHT'S DISEASE. — (*a*) *Chronic Parenchymatous Nephritis*—Origin—Symptoms—Characters of Urine—Arterial and Cardiac Changes—*Indications for Treatment*—Oxygen Inhalations—Milk Diet—Vegetable Foods—Avoidance of Animal Extracts—Drug Treatment not of great value—Diuretics — Mild Alkaline Waters — Digitalis — Caffeine—Acupuncture for Anasarca—Saline Aperients—Fuchsine—Sodium-tannate—Nitro-glycerine—Hygienic and Climatic Treatment—(*b*) *Chronic Interstitial Nephritis*—Causes—Insidious Onset—Early Symptoms—Characters of the Urine—High Arterial Tension and Cardiac Hypertrophy—Frequency of Intercurrent Affections—*Indications for Treatment*—Reginimal—Dietetic—Climatic—Medicinal. Additional Formulæ.

ACUTE BRIGHT'S DISEASE—ACUTE NEPHRITIS.

AN acute inflammation of the kidneys may be determined by exposure to cold, by the effect of chill on the surface of the body, between which and the kidneys a very close relationship seems to exist. It may also be caused by the action of toxic agents on those organs, as the poisons of the specific infective fevers, and especially that of scarlet fever.

Irritant drugs, such as turpentine, cantharides, carbolic acid, and potassic chlorate, may excite an acute congestion of the kidneys, which may run on to inflammation. It sometimes occurs in connection with pregnancy, but the precise manner in which this arises is not at present known.

The two most common causes of acute nephritis in England are exposure to cold and scarlet-fever.

The epithelium, the blood-vessels, and the intertubular connective tissue are affected in varying degrees of intensity in different forms of this affection, so that different writers, between whom there is not always to be found that complete agreement on matters of renal pathology which might be desired, describe (*a*) a *tubular* (*b*) a *glomerular*, and (*c*) an acute *interstitial* nephritis. These different forms cannot be recognised clinically, and it is in the clinical aspects of disease that we are at present mainly interested.

It is difficult to say what may be the precise physical changes in the kidneys at the onset of an attack of acute nephritis, since anatomical investigations can only disclose the *post mortem* appearances; but we may conclude that there is more or less intense hyperæmia with inflammatory exudation, containing leucocytes and red blood corpuscles, affecting especially the capillaries and the epithelium of the glomeruli. These alterations interfere with the circulation in the malpighian tufts, and seriously disturb the nutrition of the secreting tubules. Accumulations of inflammatory products—altered cells, leucocytes, and blood corpuscles—in the convoluted tubules, cause the whole organ to become enlarged and sometimes greatly swollen. More or less, also, of inflammatory exudation takes place in the connective tissue between the tubules.

What are the **symptoms** attending this affection? In some cases the characteristic appearances—pallor and puffiness of the face and œdema of the ankles—are preceded by chills and rigors, together with some lumbar pain, nausea, and vomiting. Headache, constipation, and a furred tongue are also usually present. The temperature is not always raised, and when it is it rarely exceeds 103°, and may range between that and 100°. But it is naturally to changes in the **urine** that we look for conclusive evidence of the presence of acute nephritis. The urine is usually found to be scanty (in a few cases it may be entirely suppressed), high-coloured or *smoky*, of high specific gravity (1,025 to 1,030), and to contain albumen, blood corpuscles, and casts of the renal tubules, epithelial, hyaline, and blood casts. Sometimes it is of a dark red colour, from the presence of a considerable amount of blood. The excretion of urea is diminished, although the percentage in the urine passed may be high.

Diffuse anasarca, with a marked anæmic aspect of the surface, may develop rapidly, and dropsical effusions may also take place into the serous cavities. The skin is dry and the pulse hard, from *increased vascular tension,* and the second sound over the aorta is accentuated.

Symptoms of uræmia appear in some cases. It is, however, on the examination of the urine that the diagnosis mainly depends, as cases of acute nephritis may occur without anasarca.

In the nephritis of pregnancy, the first indication of its existence may be a uræmic convulsion.

A brief duration and rapid recovery occasionally attend cases referrible to chill, but cases following scarlet-fever, however favourable their course, are rarely convalescent in less than a month. In such cases the dropsy, after eight or ten days, subsides, the urine increases in amount, and the albumen lessens. There is, however, a great tendency in these cases to become *chronic.* The most serious results in these acute cases are the occurrence of considerable effusions into the serous cavities and the onset of uræmia.

The *indications for* **treatment** are tolerably clear, they are :—

(1) To allay all irritation and excitement of the inflamed organs by securing to them, as far as possible, functional rest, *i.e.* by promoting the elimination of renal excretion by other channels ; (2) to diminish the local hyperæmia by counter-irritation and derivation to the surface ; and (3) to promptly treat serious symptoms as they arise, such as large effusions

into the serous cavities, or the symptoms due to retention of renal excrementitious matters in the blood.

It has been said that threatened attacks of acute nephritis in scarlet fever, the evidences of which were the presence of blood colouring matter in the urine and increase of arterial tension, have been warded off by a smart saline purge.

In severe cases, with fever, pain in the back and general dropsy, the following method of treatment should be adopted :—

The patient should be confined to bed, and as the proposed treatment will be directed to producing free action of the skin, he should lie between blankets and wear a thin flannel bed-gown, with long sleeves to the wrists, to avoid all risks of chill.

His diet should consist exclusively of milk or milk and water; pure milk is often difficult of digestion, but it is less likely to be so if it is diluted with one-third hot water or with hot thin oatmeal gruel. Butter-milk, if it should be preferred, may be taken instead of milk, and barley-water may also be freely partaken of. If the patient does not object, it is desirable that these drinks should be warm.

The advantage of **milk** is, that it supplies sufficient albumen to compensate for the loss by the kidneys, as well as the other substances needed for complete nutrition, while it contains the minimum of waste material for elimination. It is also a non-irritating and active diuretic.

The milk should be drunk in small mouthfuls at a time, and not in large draughts. If drunk in the latter fashion, a sense of weight at the stomach is sometimes complained of.

The free use of fluids is advisable, in order to keep the kidneys flushed—to wash out the *débris* from the renal tubules. Water, therefore, may be drunk freely, and there is no reason why it should not be freely mixed with the milk that is taken as food, especially as it promotes its digestibility, and this will be particularly the case if some alkali be added to the water. It is a good plan to have a decanter by the bedside, filled with distilled water, containing about 10 grains of sodium bicarbonate and 10 grains of potassium citrate to the ounce, and to order a tablespoonful or two of this to be added to each glass of milk and water. We agree with Sir William Roberts that it is beneficial to give some alkali in this way, in order to lessen the acidity of the urine, and so diminish its irritating effect on the kidneys.

Other drinks which may be permitted are weak lemonade (home-made without sugar), imperial drink (made by adding 1 dram of cream of tartar and the juice of half a lemon to a pint of hot water, and allowing to cool), and whey, which may be readily made by boiling milk with a little lemon juice or with cream of tartar, two tablespoonfuls to the pint, and straining. This may be taken freely; it is pleasant and nutritious, and very useful for patients who do not like, or cannot digest, milk.

Local measures to relieve the engorgement of the kidneys often prove most serviceable; and, when there is much blood in the urine, and complaint of pains in the back, they should never be overlooked. They often check threatened suppression of urine. In robust persons, 12 to 20 leeches, or a few cupping glasses, may be applied over the region of the kidneys, followed by a hot linseed poultice, which should be quickly renewed and never allowed to get cold. It too often happens that such poultices are very carelessly applied, and, to avoid this risk, it may sometimes be better, when we are not sure of our nurse, to trust to a layer of hot cotton wool. When it seems undesirable to withdraw any blood, we may employ dry cupping. Repeated hot mustard poultices are, perhaps, as efficacious as anything, and they are easy to apply. Dujardin-Beaumetz recommends the application of Paquelin's thermo-cautery.

In order to relieve the kidney of its eliminative functions, we make vigorous calls upon the excreting functions of the skin and intestinal mucous membrane, and, in doing this, we also favour the removal of renal congestion by diverting the blood more especially to the cutaneous and intestinal surfaces; and we thus also do our best to avoid the accumulation in the blood of retained urinary excreta. When there is dropsy, we also, in this way, get rid of much of the dropsical fluid.

To stimulate the skin to increased activity, we may, in the first place, employ **hot baths,** or hot air or vapour baths, or the wet pack. Liebermeister advocated the use of the hot bath in the following manner:—The patient is placed in the bath at about 100° F., and more hot water is added gradually until the temperature reaches 104° to 106°; he is allowed to remain in the bath from 30 to 60 minutes, then wrapped up in a warm sheet and warm blankets for two or three hours more. A profuse perspiration may usually be induced by this means. The difficulty about the bath is that it is not always easy to bring the bath to the patient's bedside; and there may be risk of chill in conveying the patient to another apartment for the purpose.

The **wet pack** may be employed as a substitute for the hot bath. The patient is wrapped round with a sheet dipped in hot water, and then covered up with hot blankets. Whitla describes the method he adopts as consisting in dipping a large, thick, double blanket into nearly boiling water, with which a few ounces of mustard have been mixed; this is left in for a few minutes, and then well wrung out by attendants, and the patient is carefully wrapped in it, all the body except the face and head. There is no danger of having the blanket too hot; the difficulty is in keeping it hot enough, owing to rapid evaporation from the large surface. The patient is then placed on a straw mattress, and covered with blankets, for two hours, when profuse perspiration occurs. He is then rubbed dry, and placed between warm blankets. When in the pack he is given warm barley-water, or whey, freely.

A very convenient appliance for acting on the skin is the hot-air bath (Fig. 3). It is readily extemporised. A spirit lamp is placed on the floor near the bed, with it a tin funnel is connected, furnished with a tube bent at a right angle, and of a suitable length to pass under the bed-clothes, at the foot of the bed. The bed-clothes are tucked closely round the patient's neck. The heat given off by the lamp, and the steam formed by the combustion of the spirit, usually suffice to throw the patient into a profuse perspiration. Should, however, the skin, instead of perspiring, become hot and dry, some warm stimulating drink should be given to start the diaphoresis. A bath of this kind may be frequently repeated, and any depressing effect on the heart it may produce, should be guarded against by the administration of some stimulant. The effect of these baths may often be promoted or augmented, by the simultaneous use of some stimulating diaphoretic medicine: one of the simplest and best is a dram of sal volatile, ½ a dram of spirit of nitrous ether, and 3 or 4 drams of solution of ammonium acetate, mixed with one ounce and a half of camphor water. Such a dose may be given three or four times a day. If the body temperature is high, and it is the *commencement* of the attack, 2 or 3 minims of tincture of aconite may be

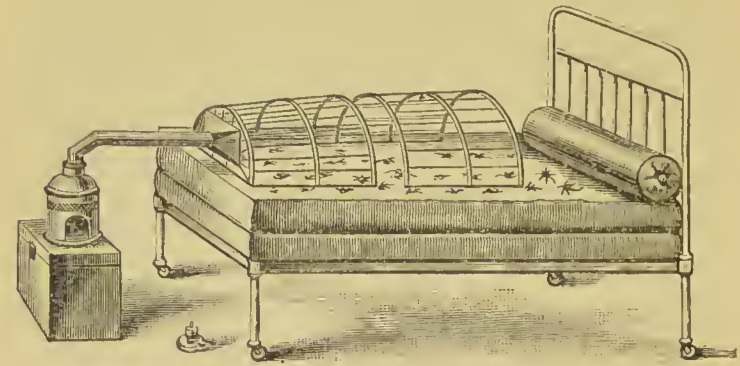

Fig. 3.—Hot-air Bath.

added to each dose, but this drug must not be continued for more than four or five doses, on account of its depressing effect on the heart; and, when it does good, the good it does is usually done at once.

But there is a drug which, when administered hypodermically, usually has an immediate and powerful effect in increasing the cutaneous transpiration, and that is **pilocarpine**; and this is frequently administered for the purpose of exciting profuse diaphoresis in acute Bright's disease. Objection has been made to its use, on account of some unpleasant symptoms that have been observed to follow its employment, such as nausea, vomiting, and even collapse. "If," says Prof. Andrew Smith, "in a desperate case, we decide upon its use, it must be with the consent of the patient's friends, based upon a full understanding of the danger."* This, we think, is somewhat too grave a view to take of the dangers attending its use; certainly, great care and discrimination should be shown in the cases in which it is administered; and, if notable cardiac weakness is known to exist, it should be withheld. The dose also should be small at first; it is better to give to an adult two doses of a tenth of a grain at intervals of fifteen minutes than to give a fifth of a grain at one dose; and the patient should be prepared for each dose by a little hot coffee, or gin and water.

We do not think it is a suitable drug for children, as they vary so very greatly in their capacity for tolerating certain medicines. Osler says, "I abandoned its employment for many years, after having several cases of serious collapse. Latterly, I have resumed its use, often with benefit."† This is the history of many active drugs. We do not give sufficient time to the study of their mode of action, and to the means of counteracting their injurious effects, so that we may avail ourselves with safety of their beneficial ones.

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* Hare's "System of Practical Therapeutics," vol. iii. p. 546.
† "Practice of Medicine," p. 745.

Free purgation is another measure adopted for the purpose of relieving the kidneys of their eliminating functions, and of removing from the blood some of the solid and toxic constituents of the urinary excretion, while it also helps to carry off dropsical effusions.

If a saline purgative is used it should be given in concentrated solution, when its action will be almost wholly confined to the bowels, and it will give rise to no irritation of the kidneys.

The compound jalap powder is the favourite purge in England for cases like these; from 30 to 60 grains, in a little water, may be given once or twice daily; or 2 or 3 drams of magnesium or sodium sulphate, dissolved in an ounce or two of water, may be given every morning fasting. It is rarely necessary or desirable to have recourse to the more violent purgatives such as croton oil, camboge, elaterium, etc.; and mercurial purgatives must especially be avoided, owing to the great risk of producing salivation when given in such cases. In milder cases it is only necessary to give aperients to keep the bowels regularly relieved, and in children, for this purpose, an ounce or two of fluid magnesia with a teaspoonful of lemon juice, early in the morning, is both pleasant and efficacious; or a few grains of compound scammony powder may be given each night.

Some differences of opinion have existed as to the propriety of giving **diuretics** in cases of acute nephritis. The stimulating diuretics, which act on the secreting cells of the kidneys, are certainly, in our opinion, counter-indicated, but this is not the case with those diuretics which simply favour the flow of water through the kidneys; we have already pointed out that such flushings of the renal tubules is advantageous. Of such diuretics *water* is the best; and, as Osler has pointed out, we may usefully add to the water small quantities of such alkaline salts as the potassium citrate or the sodium benzoate, and we would add the sodium bicarbonate; the two former are believed to have the property of favouring "the conversion of the urates into less irritating and more easily excreted compounds."

The use of diuretics which act by raising the arterial tension, such as digitalis or strophanthus, must be approached with more caution; they are certainly not suitable in the early stages, and should only be employed when the arterial tension is low and the heart's impulse feeble. They may be employed when the stage of active engorgement of the kidneys is passed, and when the cardiac force may require raising; they then often exercise a beneficial diuretic effect. It has been suggested that in the hyperæmic stage the administration of nitro-glycerine or sodium nitrite may, by lessening the general arterial pressure, relieve the strain upon the weakened renal vessels and give them the opportunity to recover their tone.*

Caffeine, which, like digitalis, raises arterial tension and so increases the flow of urine, may, in the same circumstances, be substituted for it. The best mode of giving it is as a hypodermic injection in solution in sodium benzoate; from 3 to 10 grains of caffeine with the same quantity of sodium benzoate may be dissolved in a few minims of warm distilled water and used for each injection. Or it may be given by the mouth.

We referred, when dealing with the treatment of cardiac dropsy, to the substance termed *diuretin*—a combination of theobromine with sodium salicylate. This drug has been found by Babcock, of Chicago,† to have very remarkable diuretic powers in renal, as well as cardiac, dropsy. He gives from 90 to 120 grains a day, in small doses frequently repeated in solution in warm water. He states that in a case in which cardiac and renal disease were combined, under its use the urine increased from a pint and a half a day to 12, 14, and 8 pints a day, the first, second, and third days respectively of its administration.

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* Prof. Andrew Smith in Hare's "System of Practical Therapeutics," vol. iii. p. 546.

† *New York Medical Journal*, July 11, 1891.

An efficient diuretic may often be found in a combination of potassium acetate (30 grains), infusion of digitalis (2 to 4 drams), and decoction of broom tops (1 to 2 ounces). This dose may be given every 4 to 6 hours. Potassium iodide proves a most efficient diuretic in some cases, and it does not appear to produce any irritant effect on the kidneys. In cases tending to chronicity and attended with anæmia it may be combined advantageously with the syrup of the iodide of iron.

The **symptoms** which may require special consideration in connection with the treatment of a case of acute nephritis are the following: (*a*) nausea and vomiting, (*b*) an extreme amount of general dropsy with effusion into the serous cavities, (*c*) uræmia with convulsions, (*d*) anæmia and cardiac dilatation.

Vomiting may be to a certain extent useful in eliminating toxic substances from the blood, and should not be immediately checked; but when it is continued and exhausting we must endeavour to arrest it. For this purpose small fragments of ice may be sucked, or a mixture containing the citrate of bismuth and dilute hydrocyanic acid may be given—a mustard plaster may be applied to the epigastrium—drop doses of creasote mixed with a little lime water may be given—or drop doses of tincture of iodine in water. The patient may, at the same time, be fed by nutrient enemata—peptonised milk being best for this purpose; should there be any difficulty in retaining this, 2 or 3 minims of tincture of opium (in *adults*) may be added to each enema.

An *extreme amount of dropsy*, which does not yield to the measures we have already indicated, must be relieved by draining away the fluid by *puncture* of the skin of the legs; we have described how this may be best carried out when dealing with the treatment of cardiac dropsy.

Effusion into the pleural cavities, if it give rise, by its amount, to serious dyspnœa, must be removed by puncture and aspiration. A large accumulation of ascitic fluid may require to be removed by paracentesis.

Uræmic symptoms—headache, drowsiness, convulsions—must be immediately encountered by appropriate measures. In acute forms of uræmia in the robust, the most striking relief to the symptoms is often afforded by the abstraction of 10 to 20 ounces of blood from the arm. Leeches to the temples may suffice to relieve the uræmic headache. Chloroform inhalations may be needed to allay violent convulsions. When venesection is not practised, derivation to the skin and profuse perspiration should be induced by the hypodermic injection of pilocarpine, and the bowels should be freely acted upon by a brisk purgative. A dose of elaterium may in such cases be given, as there might be some difficulty in getting the patient to swallow a draught of any kind, whereas a dose of compound powder of elaterine ($\frac{1}{2}$ to 3 grains) may be thrown on the tongue and washed down with a teaspoonful or two of water. In children dry cupping to the loins may be desirable, and the wet pack may be applied, as well as a brisk purge given.

It has been said that to excite profuse perspiration in these uræmic attacks must be injurious, by causing a concentration of the blood, unless we can at the same time ensure the free admission of water by the mouth. The best answer to this is the frequently-observed fact that patients come out of the uræmic state when, under the influence of *pilocarpine* or the wet pack, free action of the skin has been established. Much depends on the ability of the skin to take upon itself the eliminating functions of the kidneys. If it should only allow of aqueous transpiration, then excessive perspiration would certainly lead to a dangerous concentration of toxic substances in the blood, but when it is capable of freely eliminating the solid and toxic constituents of the urine, then its excessive action must be beneficial, as is in practice found, in the great majority of instances, to be the case.

A combination of chloral and bromide of potassium may be sometimes useful in allaying nervous irritation.

Jaccoud, and also Carter, believe that the danger of uræmic intoxication may be diminished by the inhalation of oxygen, about 10 litres three times a day. This conclusion is founded on the observation by Jaccoud, that sojourn in compressed air lessened by one-half the toxicity of the urine.

Cardiac dilatation and anæmia may call for cardiac tonics, such as digitalis, caffeine, etc., and if attended by pulmonary œdema, ether, strychnine, and even oxygen inhalations may be needed, as well as dry cupping and counter-irritation to the chest. The *anæmia* will usually extend into the period of **convalescence,** which needs to be very carefully watched in order to avoid the risk of relapse.

During this period the patient should be kept at rest, and only the gentlest exercise allowed, and he should be guarded from all possible chill and be extremely warmly clothed—flannel garments being worn next the skin. Great attention must be paid to the matter of food, which should for a long time be restricted to milk and light farinaceous puddings. No stimulants, beyond a little tea or coffee, should be permitted, and all animal food forbidden until the urine is free from albumen. Fresh vegetables, water-cress, lettuce, and ripe and cooked fruits may be permitted.

An iron tonic will often prove of great service; we may give a teaspoonful of the syrup of the phosphate or iodide of iron after food, twice or three times a day. Some patients bear full doses of the tincture of the perchloride well, but with others, who are prone to headaches, a combination of the ammonia-citrate (5 to 10 grains) with sodium bromide (5 to 10 grains) thrice daily answers better. It is often most advantageous to the patient to avoid the cold of an English winter after an attack of this kind, and to seek a warm winter health resort, where he can pass some hours daily in the open air without risk of chill. Madeira, the Canaries, the Azores, or one of the resorts in the West Indies, such as Nassau in the Bahamas, are the most suitable to these renal convalescents.

CHRONIC BRIGHT'S DISEASE.

In considering the treatment of chronic Bright's disease, we must recognise two principal divisions: (*a*) *chronic parenchymatous nephritis*; and (*b*) *chronic interstitial nephritis.* It is usual to consider the lardaceous, or amyloid kidney, as a form of Bright's disease, but as this affection admits of no special treatment, apart from the morbid states of which it is a consequence, we shall not treat of it here.

(*a*) *Chronic Parenchymatous Nephritis.*

This form of chronic Bright's disease either follows an acute attack or comes on slowly and insidiously. It is usually characterised by a great tendency to anasarca, and it is designated, from an anatomical point of view, the *large white kidney.* Some foreign physicians regard malaria as a common cause of this form of Bright's disease. Intemperate habits are also believed to be concerned in its causation in many cases. It is a frequent sequel of scarlatinal nephritis.

When this disease comes on insidiously, the earliest symptoms may be those of gastric dyspepsia, together with progressive debility and anæmia. The face becomes pale, and there is puffiness under the eyelids especially marked on rising in the morning, and in the evening the ankles and feet are puffy and swollen. If the **urine** is examined it is found to be scanty in quantity, and often of a "smoky" aspect from the presence of a little altered blood, and it is often turbid from urates. The deposit it throws down on standing usually displays, on microscopic examination, the presence of tube-casts, both large and small, hyaline, epithelial, granular, and fatty; red blood corpuscles, leucocytes, and renal epithelium. There is usually an abundant deposit of albumen, with heat and nitric acid. Its density in the early stages may be as high as 1,020 to 1,025, but as the disease advances the density of the urine becomes lower. There is always a reduction in the amount of urea. The presence of general anasarca, which is very obstinate, is a marked symptom of this form, and the dropsy may affect the serous cavities. Uræmic symptoms frequently occur. Arterial changes are common; the pulse tension is heightened, the vascular walls tend to become thickened and sclerosed; the aortic second sound is accentuated, and the heart is usually hypertrophied. Retinitis frequently occurs. Symptoms of gastro-intestinal irritation, such as vomiting and diarrhœa, are often observed. In very chronic cases it may be difficult to distinguish clinically this from the next form.

The main *indications for* **treatment** are identical with those in acute nephritis, except that we have no longer to deal with an acute renal hyperæmia. All that has just been said as to the applicability of diaphoretics, purgatives, and diuretics, to the treatment of acute nephritis will apply with almost equal force to these chronic forms, the main objects of treatment being to keep the blood as free as possible from contamination by toxic substances no longer eliminated adequately by the kidneys, and to remove dropsical accumulations.

Many remedies have been suggested with the *direct* object of checking the loss of albumen in the urine, but for this purpose all the most capable authorities have been compelled to admit that we have no drug of any great value.

The temporary disappearance of albumen from the urine has, however, been noted under the influence of inhalations of oxygen, and Dujardin-Beaumetz and others have reported cases in which this has been observed; but after a few weeks of amelioration, the albumen in the urine reappears, and the disease follows its usual course. Perhaps the most successful method of treatment of these cases that has as yet been adopted is the restriction of the patient to an **absolute milk diet.**

In the application of this or of any other method, it is, of course, scarcely necessary to say, that it would be fallacious to regard the mere fact, of a diminution in the amount of albumen passed in the urine, as indicative of a curative effect, unless accompanied also by an improvement in the nutrition, strength, and general condition of the patient.

The advantages of milk as a food for the subjects of chronic renal disease are obvious. Although, theoretically, it contains an excess of albuminates in proportion to hydrocarbons, this could readily be rectified, if it were desirable, by the addition of more cream and lactose, and dilution with water. But, in actual practice, it is often found that skimmed milk, in which this disproportion is, of course, much greater, agrees better with the patient than milk containing its full proportion of cream. The great recommendation of milk in these cases is that it contains no refuse substances; all its nitrogenous constituents can be absorbed and utilised; it contains an easily-digested form of fat; its lactose is diuretic; and none of the principles it contains appear capable of causing any irritation of the renal epithelium; so that not only does it not introduce into the blood any, more or less toxic, refuse materials, but it contributes to the elimination of those formed in the body. We would add that we consider its digestibility greatly increased for many patients by dilution with one-third hot water, and the addition of sodium chloride, in the proportion of 20 grains to the pint. As a variation in the monotony of milk diet, a hot *milk soup* is very useful, which may be flavoured with a little celery salt; or some shredded Spanish onion, well boiled, may be added to it. Or the milk may be semi-solidified by the addition of a little hot solution of isinglass, flavoured with lemon-peel, and allowed to cool. Indeed, by a little ingenuity, milk may be presented in a variety of forms and flavours. If the patient is content and doing well with the milk diet there is no need to change it; but this will only exceptionally be the case, and the majority will grow tired of this exclusive diet, and insist on some change; and some will not digest it satisfactorily.

In such cases we may add to the dietary some agreeable vegetable food; we may allow some toasted bread and a little macaroni, rice, or tapioca. A little fruit jelly may also be added. In all cases we must look carefully to the digestive functions, and see that they undergo no serious disturbance; for we must bear in mind that any toxic substances, formed during the digestive process, may either irritate the kidneys in their elimination, or tend to poison the blood by their retention in the body.

Although, as we have said, we must not regard the decrease or increase of the amount of albumen in the urine as the *only* reliable criterion of the suitability of any particular dietetic treatment, yet it is by no means an unimportant one, and it is one which it would be most unwise to disregard; but we must, at the same time, look to the *general condition* of the patient; and, when that keeps satisfactory, and if the density of the urine is also satisfactory, we should not hastily conclude that the diet is unsuitable because rather more albumen is excreted. So, on the other hand, although less albumen may appear in the urine, if the general condition of the patient is deteriorating, and the density of the urine keeps low, we may fairly doubt the propriety of continuing a severely restricted diet. Probably no greater dietetic error has ever been so tenaciously adhered to as that of prescribing strong animal extracts and broths for all kinds of invalids; and the immense number of preparations of this kind that is still being introduced to the notice of the profession and the public seems to indicate that there is no disposition to relinquish their employment.

It should be remembered that most of these preparations have little food-value; and that their mode of preparation ensures the extraction of any toxines that may be contained in the meat. We have often seen the pulse rise ten to twenty beats, and the arterial tension increase considerably, together with the appearance of much digestive discomfort, after the patient has partaken freely of some of these meat extracts. The soluble nitrogenous extractives they contain are in a condition to pass directly into the blood, and so to at once reach the kidneys, which they can scarcely fail to irritate; while they are calculated seriously to intensify the risk of uræmia. They should be strictly excluded from the dietary of the albuminuric.

Grainger Stewart, while recognising the great value of milk as the most suitable food for these cases, is disposed to depart somewhat from the exclusive milk diet, and to allow a small proportion of white meat, pudding and fruit to be added to the dietary. Some difference of opinion exists as to the suitability of fish for the albuminuric. Senator recommends it; but Lépine and others think it sometimes increases the amount of albumen in the urine. Eggs should certainly be avoided. As we have pointed out elsewhere,* "farinaceous foods, fish, vegetables and fruits, together with milk, butter, cream and other fats, afford all that can be needed for the nutrition of the body;" and a careful selection from this wide range should afford an ample variety of diet for our patients.

There is not very much to be said in favour of drug treatment in chronic Bright's disease, save to meet indications presented by particular symptoms, or states which may arise during its progress. The measures appropriate to the treatment of uræmia, of dropsy, and of certain other symptoms, which may occur in the course of chronic, as well as acute, cases, have been considered when discussing the treatment of the latter, and we have little to add to what was there set forth.

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* See the author's "Food in Health and Disease," chap. ii. part 2, for a full discussion of this subject.

Diuretics may be more freely used in chronic cases; and the use of mild alkaline waters may be especially commended for the purpose of exerting a diuretic action without causing renal irritation. A scanty secretion of urine from cardiac asthenia indicates the use of cardiac tonics, and digitalis may, in such cases, be found a valuable resource. The tincture, in doses of 10 to 15 minims twice a day, often advantageously combined with iron, is the best preparation. As Lépine has pointed out, it is as well in these cases to give this drug only on alternate days, or only on every third day, so as to allow of sufficient time for its elimination. Caffeine is also a good cardiac tonic and diuretic in these circumstances, and may be administered hypodermically up to 15-grain doses, dissolved in sodium benzoate. Strophanthus and squill are to be avoided, as irritating to the kidneys. Grainger Stewart commends, as a diuretic, a combination of scoparius, digitalis and potassium acetate; and he does not object to juniper and copaiba in the later stages. He considers nux vomica assists their action. He has also found a combination of iron and arsenic of great service.

Symptoms of intercurrent renal congestion, such as the appearance of a certain amount of blood in the urine, should be met by counter-irritation over the loins, and the administration of jaborandi or pilocarpine.

Draining off the fluid by Southey's tubes, taking care that the skin and the tubes are rendered thoroughly aseptic, is the best means of removing great and general dropsical accumulations; or a number of punctures with a needle may be made, the needle being freely moved about before withdrawal, over the dorsum of the foot, the ankle, and the leg, after which the leg should be wrapped up in warm, moist flannel, and allowed to drain. Large peritoneal accumulations will require to be removed by tapping.

The regular administration of saline aperients is of great importance, for the purpose of guarding against the retention of toxic substances in the blood, and the occurrence of uræmic symptoms; a full dose of white mixture (magnesium sulphate and carbonate), the first thing in the morning, is, perhaps, the best. It may, if necessary, be preceded by an aloes-and soap pill at night. Potassium bitartrate and the compound jalap powder are also good aperients in these cases.

Numerous drugs have been administered in this disease, and some have been said to have the power of diminishing the excretion of albumen; but few have borne the test of time. One of these is *fuchsine*, which has been repeatedly given in this disease by different physicians, and qualified commendation of its effects has been advanced by Dujardin-Beaumetz, Grainger Stewart, and others. A distinct diminution in the amount of albumen in the urine has been noted as a consequence of its use. Dujardin-Beaumetz gave 3 to 4 grains, *in cachets*, twice a day. It is best given in cachets, to avoid colouring the teeth and mouth.

Sodium tannate has been found by some to diminish the amount of albumen excreted, others have failed to obtain this result from its use.

Nitro-glycerine has been strongly recommended for the purpose of relieving those symptoms of high arterial tension for which blood-letting has also been proposed. From ½ a minim to a minim of the 1 per cent. solution should be given every hour or two for five or six times, and then less frequently.

But in the milder chronic cases of this form of Bright's disease it is on the judicious use of general hygienic measures that the chief reliance must be placed. The care of the general health, the regulation of digestion and alvine excretion, the promotion of the excretory functions of the skin, the regulation of clothing and exercise, the selection of a suitable climate, all these are of the greatest importance in promoting the restoration of such patients to health or the prevention of the advance of the disease.

Of the food suitable to these cases we have already spoken, and on this point we have only to add that as improvement in health is established, a slow and gradual return to the ordinary diet may, with careful supervision, be permitted. Symptoms of dyspepsia are best treated by almost complete abstinence from food for a short time, a little thin peptonised oatmeal gruel only being taken; buttermilk has been found to be well borne in some of these dyspeptic states, and Whitla suggests it may perhaps neutralise, in the more advanced cases with obstinate vomiting, free ammonia eliminated by the gastric mucous membrane. Whey made with lemon juice would probably have the same effect. Suitable aperients must of course be given. Intestinal antiseptics may occasionally be of service when symptoms of flatulence and intestinal indigestion are prominent. Half a minim of creasote in a pill with powdered soap, or a grain of thymol, or 5 grains of salol may be ordered three or four times a day when food is taken.

The functions of the skin must be promoted by hot baths—the safest and best is a very hot bath (as hot as can be comfortably borne) with a bag of bran wrung out in it, at bed-time; the patient, after a quick rub-down, should be wrapped up in a flannel dressing-gown or night-shirt, and at once sent to a warm bed. Dry friction of the skin in a thoroughly warm room should be prescribed on getting up in the morning, and in cold weather a very liberal amount of rest in bed should be insisted upon. An albuminuric patient in the English climate, in winter, may very profitably pass much of his time in bed, or in one warm room. Prof. Semmola, of Naples, confines such patients during winter to one large room, the temperature of which is kept constantly between 60° and 68° F.

Warm clothing should, of course, be insisted upon; woollen garments should be worn next the skin, and a broad woollen band worn round the loins is an additional protection.

It is a great advantage to such patients to be able to change to a **more genial climate** in winter and spring.

It is common to recommend such patients to winter in one of the resorts on the Riviera, or in Algiers or Egypt, and although these resorts are better than any place within English shores, they are not the very best climates for the albuminuric, as they all lack that equability of temperature which is so beneficial to them. It is certainly most surprising to find Dujardin-Beaumetz speaking, in this connection, of Cannes and Monaco, and other places on the Riviera, as having a temperature "almost always constant"! This is far from being the case. The best climate for the subjects of chronic Bright's disease is a somewhat humid, warm, equable one, which will exercise a decided influence in promoting the activity of the skin. Madeira, Orotava, the Azores, are the most accessible of such climates to English patients, but the most perfect resorts of this kind are to be found in the West Indies, and surprising benefit often follows a prolonged residence there.

(*b*) *Chronic Interstitial Nephritis.*

This is the form of chronic Bright's disease which is associated with the small, contracted, cirrhotic, "gouty" kidney; together with general arteriosclerosis and cardiac hypertrophy. Its causes are chiefly gout, lead-poisoning, and alcohol. Its occurrence in early life is rare; it is unusual to meet with a typical case under 30; it is most common between 40 and 60 years of age, less so between 60 and 70, and rare after the latter age. It is more frequent in males than in females, in the proportion of about 2 to 1.

This disease is always insidious, and is often attended with much obscurity at its commencement, while its course is characterised by extreme slowness. The disease may exist in an advanced degree, and the patient yet present great bodily and mental power. The earliest symptoms are usually those of disturbed general health. There is a sense of lassitude and weariness, the patient is sleepless and complains of having to get up once, twice, or oftener, during the night, to pass water. The tongue is generally dirty, and the digestion is disturbed; there is a tendency to dyspnœa on exertion; headache and troubles of vision are also complained of.

The **urine** is generally increased in quantity, and there is increased thirst. It is pale, clear, and of low density, 1005 to 1012. It rarely contains much albumen, and it requires careful and delicate testing to discover it; it may occasionally be entirely absent, especially in that passed in the early morning. Tube casts are not always present, but usually a few hyaline or granular casts may be found. The amount of urea is often, but not always, diminished. The pulse is hard from increased arterial tension, and the wall of the artery is commonly thickened. Continuous high arterial tension is one of the earliest and most important symptoms of this form of chronic Bright's disease. The presence of cardiac hypertrophy is another almost constant feature; the left ventricle hypertrophies to overcome the resistance in the arteries. The first cardiac sound at the apex may be re-duplicated, but more commonly the second sound in the aortic area is strongly accentuated.

Intercurrent affections of other organs are common. Sudden œdema of the glottis; pleural effusions; sudden œdema of the lungs; nocturnal dyspnœa and renal asthma; acute pneumonia, pleurisy, bronchitis; uncontrollable vomiting; severe diarrhœa; *cerebral hæmorrhage;* visual troubles, retinal hæmorrhage, retinitis, etc., may occur; cerebral hæmorrhage and retinal changes being especially common. · Epistaxis has often been noted as an early premonitory symptom. *Dropsy* is rare, and when it occurs it is usually either due to cardiac failure in the advanced stages, or to the "supervention of *parenchymatous nephritis* upon antecedent cirrhosis." Eczema is common.

The chief clinical features which distinguish this, from the preceding form of chronic Bright's disease, are its slower progress and usually insidious onset, the small amount of albumen in the urine, the infrequency of general dropsy, and the constant coexistence of cardio-vascular changes.

The following *indications for* **treatment** are deducible from the preceding brief description of the general characters of the disease :—

1. In the early stages, to relieve the heart, arteries, and kidneys from further strain and irritation.
2. When there are evidences of greatly increased arterial tension, to lessen it.
3. To strengthen and support the heart when signs of dilatation and failure appear.
4. To promote the elimination of toxic substances especially when symptoms of uræmic intoxication supervene.

1. The treatment in the early stages must be mainly regiminal and dietetic. An *exclusive milk diet* is less urgently needed than in the preceding form, at the same time the diet should be regulated on the principle of giving those foods which will leave but little nitrogenous waste to be eliminated. Milk and farinaceous foods, in light and digestible forms, with well-cooked fresh vegetables, and such fresh salads as lettuce and watercress, should compose a large part of the daily dietary. Animal food, to the extent of 3 or 4 ounces of well-cooked meat, may be taken once a day, and this should rarely be exceeded; but we must not be too absolute, and in all cases we must study the individual digestive capacity, and the special nutritive needs of the constitution.

All alcoholic drinks must, as a general rule, be forbidden. Tea, coffee and cocoa may be permitted. Weak alkaline mineral waters should be drunk freely, in order to maintain as active elimination as possible by the kidneys, and, by diminishing the acidity of the urine, to render it less irritating to those organs. Vals, Vichy, Apollinaris waters are all useful for this purpose; they may be taken mixed with milk, or with a little added lemon juice. When there is much dyspeptic trouble, with a dirty tongue and foul breath, it is a good plan to give a small tumblerful of warm Vichy water half an hour or an hour before the principal meals.

It is *most important* to see that there is free daily evacuation of the bowels. No harm can arise, but much good, from a little free purgation occasionally; at any rate constipation should never be allowed to go unrelieved. A dose of the ordinary white mixture, or of Carlsbad or other aperient salts, should be taken if necessary every morning, and this may be rendered from time to time more effective by an aloetic pill the night before. The functions of the skin should be promoted by a daily tepid bath, followed by brisk friction of the surface. All mental excitement and business strain or worry should be, so far as possible, avoided. Gentle exercise in the open air, in fine weather, is advantageous, but all violent or excessive exercise is injurious, as it not only increases the amount of nitrogenous waste to be secreted, but it throws additional strain on the hypertrophied heart and sclerosed arteries.

In order that the patient may have the advantage of the decidedly tonic influence of gentle exercise, or of sitting out a good deal in the open air, a residence during winter in a more favourable climate than that of Great Britain is indicated. We have already referred to such climates (page 275). Osler recommends southern California as a permanent residence for American patients.

So far as medicines are concerned, it is doubtful if we can do much more in order to respond to this first indication than give, as we have pointed out, mild alkaline diuretics and regular aperients.

Many physicians, however, have a firm belief in the usefulness of **potassium iodide** in checking the progress of arterial sclerosis. Profs. Bartels, Germain Sée, and Semmola, have strongly supported its use, and the latter has prescribed the following as a drink for such patients: potassium iodide, 15 to 20 grains, sodium phosphate, 30 to 45 grains, sodium chloride, a dram and a half, to be dissolved in a quart of drinking water.

There are certain cases of albuminuria, not very rare, in which gout and constitutional syphilis are combined; in such cases the use of potassium iodide is attended with great improvement. Whitla thinks the chloride of gold, $\frac{1}{15}$ grain in a pill thrice daily, is more useful than the iodides in exercising a favourable influence over the sclerosis.

2. To lessen excessive arterial tension, potassium or sodium iodide will certainly often prove most useful. It has been well pointed out that, in our efforts to correct excessive high tension, we must not fall into the opposite error of greatly lowering the tension, for, in that case, the risk of effusion into serous cavities is greatly increased; but we should aim at a happy medium. The action of the skin should be promoted by hot baths (some take objection to hot-air baths as likely to induce uræmia), followed by envelopment in blankets as already mentioned (page 259). The food should be very light, and a saline purge should be frequently given.

Nitro-glycerine is now largely employed for this purpose; 1 minim of a 1 per cent. solution may be given three times a day, and the dose increased according to the tolerance of the patient for this drug, which varies very greatly. Osler states that he has given 10 minims of the 1 per cent. solution, and even "much larger doses," three times a day "for weeks at a time," and has never seen any ill effects from it. He gives it for six or seven weeks, then stops for a week, and then resumes it. It not only relieves the arterial tension, but it coincidently relieves the dyspnœa, the headache, and the dizziness.

3. Anæmia, and a tendency to cardiac dilatation and failure, are often present in the more advanced stages of the disease. For the anæmia, when that is a prominent symptom, iron is needed. It may often be wisely combined with digitalis. Weir Mitchell

has found large doses of the tincture of perchloride of iron, 30 to 60 minims three times a day, very beneficial in such cases, and he considers it an important means of reducing arterial tension.

Strychnine is also an excellent cardiac tonic in these cases; it may be given in combination with digitalis and iron, or it may be injected hypodermically (5 minims of liquor strychninæ).

4. We have already, in preceding sections, dwelt on the appropriate treatment of uræmic manifestations. In the cases we are now considering we perhaps more frequently meet with the slighter manifestations of the approach of these ultimate troubles, such as headaches, palpitations, cramps, and occasional attacks of nocturnal dyspnœa (renal asthma). In these, as in other cases, to promote elimination is the paramount indication; the production of free purgation and copious perspiration, by the means already pointed out, should be our first care. To relieve arterial tension we may use nitro-glycerine; this also, and nitrite of amyl, may be used to relieve the attacks of uræmic dyspnœa; inhalations of chloroform will also be useful to relieve this condition, as well as the severe uræmic convulsions. Chloral may also be given to allay uræmic convulsions, either by the mouth, or, when this is not practicable, by the rectum. We have already pointed out the utility of blood-letting in certain cases.

Delirium and restlessness may be best relieved by the administration of chloral, combined with sodium bromide. It used to be taught that there was great risk of inducing fatal cerebral symptoms, if opium or morphine were given to patients with chronic Bright's disease; and we have ourselves seen rapidly fatal result follow the administration of a small dose of opium, given to relieve the nocturnal dyspnœa in a case of this kind. Fagge has borne testimony to the like effect.* However, Osler, Mackenzie, Loomis, and others, maintain that it is quite safe and proper to give morphine in uræmic states. Osler says, "for the restlessness and delirium, morphine is indispensable." We cannot help fearing, nevertheless, that, if opium and morphine are used freely for this purpose, the restlessness of uræmia will occasionally be relieved by the repose of death.

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* "Practice of Medicine," vol. ii. p. 499.

ADDITIONAL FORMULÆ.

In acute Bright's disease.

℞ Infusi jaborandi (1 in 45) ad 6 oz.
Syrup. aurantii, 5 drams.

M. f. mist. A tablespoonful every hour or two.
(*Bamberger.*)

Diaphoretic mixture in acute Bright's disease.

℞ Tinct. aconiti, 16 minims.
Potassii citratis, 4 drams.
Liquor. ammonii acetatis, 2 oz.
Aquæ camphoræ ad 8 oz.

M. f. mist. A tablespoonful every hour. (*Whitla.*)

For anasarca in acute Bright's disease (after the acute symptoms have subsided).

℞ Tinct. ferri perchlor., 6 drms.
Liq. ammonii acet., 3 oz.
Aquæ chlorof., 6 oz.

M. f. mist. A tablespoonful in a wineglassful of water every four hours. (*Whitla.*)

Diuretic in acute Bright's disease.

℞ Potassii citratis, ½ oz.
Infusi digitalis, 2 oz.

M. f. mist. Two teaspoonfuls in aërated water every three hours.
(*Prof. A. H. Smith.*)

Fuchsine mixture in acute Bright's disease.

℞ Fuchsine, 1 grain.
Ess. menth. pip., 2 minims.
Syrup. et aquæ ad 1 oz.

M. To be taken daily.
(*Bouchut.*)

Fuchsine pills (more suitable than the above).

℞ Tannin, 2 grains.
Fuchsine, 1 grain.
Extr. cinchon., q.s.

Ut f. pil. One night and morning.

To check the waste of albumen.

℞ Acidi gallici, 2 drams.
Acidi sulphur. dil., ½ dram.
Tinct. lupuli, 1 dram.
Infusi lupul. ad 6 oz.

M. f. mist. A tablespoonful three times a day. (*Aitken.*)

As a diuretic in Bright's disease.

℞ Tinct. digitalis, ½ oz.
Vini scillæ, 1½ oz.
Spr. ætheris nit., 2 oz.

M. A teaspoonful in water every three or four hours.
(*Millard.*)

In chronic Bright's disease.

℞ Potassii iodidi, 15 grains.
Sodii phosphatis, 30 grains.
Sodii chloridi, 75 grains.
Aquæ ad 20 oz.

M. f. mist. To be taken in the twenty-four hours. (*Semmola.*)

Tonic and diuretic.

℞ Tinct. ferri perchlor., ½ oz.
Acidi acetici, ½ dram.
Liq. ammon. acet., 5 oz.
Curacoæ, 2 oz.

M. A teaspoonful, in water, thrice daily. (*Da Costa.*)

Hydragogue purge in Bright's disease.

℞ Potassii tartarati, 1 to 1½ dram.
Jalapæ pulv., 8 grains.
Cambogiæ pulv., 1 grain.

M. f. pulv. To be taken night and morning. (*Baskell.*)

In Bright's disease.

℞ Pilocarpinæ hydrochlor., 1 gr.
Sacchari lactis, 10 grains.

M. et div. in pulv. 10. One three times a day. (*Baskell.*)

Tonic pills in chronic Bright's disease.

℞ Ferri sulphatis, 75 grains.
Sodii bicarb., 75 grains.
Extr. taraxaci, q.s.

M. et div. in pil. 60. Take three pills night and morning. (*Bamberger.*)

Tannin pills for albuminuria.

℞ Acidi tannici, 75 grains.
Extr. aloes aquosi, 30 grains.
Pulv. et ext. glycyrrhizæ, q.s.

Ut f. pil. 60. Two to four pills thrice daily. (*Bamberger.*)

In uræmia.

℞ Acid. benzoici, 7½ grains.
Sacchari alb., 75 grains.

M. et divide in pulv. 6. One every two hours. (*Bamberger.*)

Part VII.

DISEASES OF THE NERVOUS SYSTEM.

CHAPTER I.

THE TREATMENT OF DISEASES OF THE BRAIN AND ITS COVERINGS.

TUBERCULAR MENINGITIS.—Its Nature and Seat—A Bacillary Infection—*Symptoms*, in Children ; in Adults—*Treatment*, to be of any use, must be applied early—Potassium Iodide—Iodoform Ointment — Mercurial Inunction — Antipyretics — Surgical Treatment.

SIMPLE MENINGITIS.—Causes—Symptoms—Indications for *Treatment*— Sedatives — Trephining — Anti-syphilitic treatment — Cold Applications—Antiseptics in Infective Cases—Antipyretics—Diet.

APOPLEXY (*Cerebral Hæmorrhage, Embolism, and Thrombosis*).—Nature of the Apoplectic State—Its Causes—Hæmorrhage from Arterial Degeneration—Relation to Chronic Renal Disease —*Symptoms*—*Treatment* in the Attack—Indications For and and Against Blood-letting—Purgatives—Management of the Stage of Reaction—Use of Hæmostatics, Ergot, etc.—Syphilitic Cases—Embolic Cases—Treatment on recovery from the Attack—Treatment of HEMIPLEGIA—Of Muscular Rigidity and Contractions—Use of Electricity—Diet and Regimen—Thermal Treatment—Preventive Measures—Surgical Proposals. Additional Formulæ.

THE scope for active therapeutic intervention is very limited in many diseases of the central organ of the nervous system ; and, as our main object in this work is to deduce *indications for treatment* from a consideration of the nature, causation, and phenomena of disease, we shall confine ourselves, in this chapter, to a brief survey of those affections only which admit of remedial interference or management on the part of the *physician*.

We shall also have to assume that the diagnosis, which, in some forms of these diseases, may necessitate a long and detailed examination, and a careful analysis of a complex group of symptoms, has been accurately made.

In the first place we propose to consider the treatment of the most frequent and most fatal of those affections, viz.:—

TUBERCULAR MENINGITIS.

This disease, at one time commonly described under the name of "*acute hydrocephalus,*" from the fact that an accumulation of fluid in the ventricles of the brain is a frequent consequence of this affection, is really an inflammation of the membranes of the brain, due to **tubercular infection.**

The deposition of tuberculous nodules, surrounded by inflammatory exudation, is more abundant at the base of the brain than elsewhere; and from this situation it may extend, more or less widely, over the convex surface of the brain, and along the pons and bulb to the upper part of the spinal canal. It also extends along the choroid plexuses into the ventricles. The fluid in the ventricles is increased, and its character altered; and the surrounding brain substance is often softened and nearly diffluent.

Meningeal tubercle rarely occurs independently of some other local tubercular lesion, or apart from general tuberculosis. The causal relations of this disease fall under those of tuberculosis generally; the exciting cause of the lesion in question being, doubtless, the entrance of the tubercle bacillus into the circulation. There are cases on record where the patients have died with all the symptoms of tubercular meningitis, and yet, after death, no recognisable coarse anatomical lesions in the brain or its membrane have been found; and, in other instances, although small tubercular nodules have been found on the pia mater, they have not been surrounded by any inflammatory changes.

These observations would seem to justify the inference, that tubercle bacilli can excrete substances so toxic to brain matter, that they may cause lethal effects, even before any coarse anatomical evidence of their presence is developed.

The chief symptoms of this disease, as observed in children, are the following: after two or three weeks, or longer, of what are regarded as *premonitory* symptoms, such as emaciation, restlessness, loss of appetite, disordered bowels, peevishness, languor and dulness, and sometimes headache and drowsiness, the symptoms of the onset present themselves; the earliest being usually vomiting, then convulsions, and then severe headache, so severe, at times, that the child, while putting its hand to its head, utters a short, sudden cry, the "hydrocephalic cry," or he may go on screaming continuously. There is constipation, and usually a furred tongue. The temperature commonly fluctuates between 101° and 103°; and the pulse, at first quickened, may become irregular and slow. The pupils are often unequal or contracted. This "*stage of irritation*" is followed by a "stage of pressure." There is loss of consciousness; frequent grinding of the teeth; pupils dilated and insensible; there is general loss of muscular power and evidence of paralysis of one or more of the cranial nerves may appear, as ptosis and squint. The so-called "*tâche cérébrale*" may now be observed. Optic neuritis is frequently revealed on ophthalmoscopic examination. Notable abdominal retraction is observed in this stage. Irregularities in the pulse and respiration are common. Finally, the coma and paralysis increase; convulsions and spasmodic muscular contractions, especially of the muscles at the back of the neck, are frequent; and a general typhoid state sets in, with dry tongue, rapid pulse and low delirium. Remarkable subnormal temperatures have been noted in this stage, and occasionally high ones, 106° to 107°. Now and then a remarkable but brief remission in the serious symptoms takes place, and false hopes of recovery are excited. In *adults*, the onset is usually gradual and insidious; but the acute invasion may be very quickly fatal. Occasionally some local paralysis, as of the facial nerve, or general hemiplegia, may be one of the first symptoms.

The occurrence of violent delirium is regarded as indicating extension of the tubercular infection to the convolutions of the upper surface of the brain.

The first question which arises in regard to the **treatment** of tubercular meningitis is this: Are we to consider this disease as necessarily and inevitably fatal; or may we entertain the belief that recovery is possible? Cases, few in number it is true, have been reported in which all the symptoms of this affection were undoubtedly present, and yet the patients recovered; and in two or three rare instances the opportunity for subsequent post-mortem examination has proved that the diagnosis of the nature of the original attack was correct.* Still, perhaps, the greater number of authorities believe this to be an incurable disease. Osler says, "I have neither seen a case which I regarded as tuberculosis recover, nor have I seen post-mortem evidence of past disease of this nature." Niemeyer is more hopeful; he says, "even excepting the cases where the diagnosis was somewhat uncertain, there is no doubt that recovery has occurred." Dujardin-Beaumetz maintains the same view, and quotes, in support of this opinion, a case that was under his own care, in which, during the acute attack, ophthalmoscopic examination by Meyer revealed the presence of tubercles in the choroid. This man made a complete recovery.†

All physicians are, however, agreed that, if therapeutic intervention is to be of any service, it must be during the earlier stages of the malady; and that there can be no chance for curative measures when extensive inflammatory exudation and alteration of the membranes and brain substance have taken place.

The prophylaxis of this form of tuberculosis, in the children of tuberculous parents, falls under the same considerations as have already been dwelt upon when treating of the prophylaxis of phthisis.

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* See Fagge's "Practice of Medicine," vol. i. p. 646.

† "Clinique Thérapeutique," vol. iii. p. 248.

Of the remedies that have been suggested as especially applicable to the treatment of tubercular meningitis, **potassium iodide** stands foremost. So careful and cautious an observer as Niemeyer believed he had seen two cases recover under its administration. He recommends that it should be given in large doses and for a long time. In children we may give, according to the age, from 1 to 5 grains three or four times a day, and in adults as much as 10 to 15 grains. Niemeyer noted that in the cases in which recovery followed its use, there was a very extensive iodine eruption and an iodine catarrh of the nose, and that these signs of iodism were absent in the non-successful cases.

We have always thought it somewhat remarkable that whenever the administration of potassium iodide leads to the cure of disease, the idea of sypbilis instantly springs to the minds of most physicians. This is surely a sign of singular narrowness of view. If potassium iodide is so remarkable an antagonist to the syphilitic poison, and supposing syphilis to be caused by a pathogenic microbe, why should it not act similarly towards some others? Why should we assume that it *can* only counteract syphilitic infection? Why may it not be, in circumstances at present unknown, particularly favourable to its action, an efficacious antidote to tubercular infection? A syphilitic node melts away and disappears under its use, why not a tuberculous nodule? The answer, of course, to this is, that tuberculous nodules, in other situations, are not observed to disappear under the influence of potassium iodide. This is true in a certain sense, but it is not true *universally*, because this drug has not been tried in a sufficient number of cases to warrant the conclusion that it might not, under certain conditions especially favourable to its action, lead to their disappearance.

Reports have been published of cures of this disease following the inunction of iodoform ointment, and in an affection which is generally so fatal, the application of a suggestion of this kind should surely be given a fair trial. Whitla * relates a case, the daughter of a hospital nurse, who was believed to be dying from tubercular meningitis, and "after profound coma and squint had lasted several days" he caused "a quantity of mercurial ointment" to be rubbed in. "As a free and copious secretion of saliva poured out of the mouth some hours afterwards, the patient opened her eyes after a short time, and rapidly gained consciousness and made a speedy recovery." We do not see why Prof. Whitla should conclude, because of this unexpected result, that he was mistaken in regarding the case as one of tubercular meningitis, and for the same reasons as we have set forth in referring to the curative effect of potassium iodide. It is worth remarking that just as notable *iodism* occurred in Niemeyer's successful cases with potassium iodide, so notable *salivation* occurred in Whitla's successful case with mercurial inunction. Our views as to the curability of tubercular peritonitis have undergone a remarkable change; it may be that those entertained with regard to tubercle of the meninges are destined also to great modification.

Long Fox † has advocated the use of antipyretics in tubercular cases, on the ground that pyrexia favours bacillary growth and activity. Antipyrin may, therefore, be given, although we should ourselves prefer a combination of quinine and phenacetin. We have observed very remarkable benefit from this combination in the delirium, with high pyrexia, of epidemic influenza, as we shall hereafter point out.

A proposal to treat surgically tubercular meningitis, on the same lines as those adopted in the treatment of tubercular peritonitis, has been seriously entertained by Senn, of Chicago, and Kern, of Philadelphia. The former would tap with a small trocar, under strict antiseptic precautions, and inject 2 drams of a 10 per cent. iodoform glycerine emulsion. Keen would open the skull, tap the ventricles, irrigate and drain.*

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* "Dictionary of Treatment," p. 516.

† *American Journal Medical Science*, vol. xcix., June, 1890.

Such are the chief points to be noted in the special treatment of tubercular meningitis; its *general* treatment must be conducted on the same principles as apply also to non-tubercular forms, which we propose, in the next place, to briefly examine.

SIMPLE MENINGITIS.

So-called simple meningitis may arise in a variety of circumstances; traumatism is a common cause, so is chronic disease of the bones of the skull, such as syphilitic caries and necrosis, and, apart from disease of the cranial bones, syphilis seems capable of exciting meningitis. Disease of the internal ear may lead to meningitis or to cerebral abscess. It is sometimes an extension of erysipelatous infection in erysipelas of the scalp; it sometimes arises as a complication of acute disease, as pneumonia, acute rheumatism, small-pox, etc.; in septicæmia, pyæmia, and in ulcerative endocarditis it may occur. Exposure, with the head unprotected, to strong sun-heat, and over-study have been put forward as causes. Cases occasionally occur, not referrible to either of these causes, and are, on that account, termed *idiopathic*.

The **symptoms** of the non-tubercular forms of meningitis bear a general resemblance to those of the tubercular variety; those most commonly present are severe and continuous headache, delirium, rigidity and spasm or twitchings of the muscles, convulsions (not so common as in the tubercular form), stiffness and retraction of the muscles of the neck, vomiting, (frequent in the early stage), constipation, optic neuritis (when base is involved). Local paralysis from lesions to nerves at the base may be present, such as ptosis, squinting, facial palsy, etc. The pupils, contracted in the early stage, become later on dilated or unequal. There is usually pyrexia, and the temperature may rise to 103° or 104° F. The non-tubercular form is not considered so hopeless and necessarily fatal as the tubercular form, though Osler regards "cases of recovery as extremely doubtful."

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* Hare's "System of Practical Therapeutics," vol. iii. p. 312.

The first indication for **treatment** is to endeavour to relieve the severe headache and to allay cerebral excitement.

The patient should be put into a darkened, quiet, airy room, in a comfortable bed, with his head raised: his bowels should be at once freely opened by a few grains of calomel and a saline purge, which may be advantageously repeated from time to time. To check vomiting, an effervescing mixture, with an excess of sodium bicarbonate, and 10 grains of sodium bromide and a dram of cherry-laurel water in each dose, should be given every three or four hours, and the patient may also suck fragments of ice. In the young and vigorous a few leeches behind the ears will certainly do no harm, and may help to relieve the headache. The head should be shaved, or the hair cut short, and cold continuously applied, either by means of Leiter's tubes or a well-adapted ice-bag. Mustard plasters to the nape of the neck have been found to relieve pain and restlessness. Besides the sodium bromide in the above mixture some additional sedative to the nervous system may be useful; small doses of morphine may be injected hypodermically ($\frac{1}{24}$ to $\frac{1}{6}$ grain in the adult), or enemata of chloral (15 to 45 grains), dissolved in water with an equal quantity of potassium bromide, may be given. Frequent small doses of antipyrin or exalgin may prove useful in relieving the pain in the head; paraldehyde has been stated to be valuable as a sedative in traumatic and chronic alcoholic cases. If the attack has arisen in connection with chronic ear disease, and if any localising symptoms are present, *trephining* may be advisable. Should there be any, however slight, reason for suspecting a syphilitic taint, we should give potassium iodide freely, and order mercurial inunction.

Some German physicians have strongly advised cold affusion, especially in the comatose stage; the patient's head having been brought over a receptacle by the side of the bed and supported there, cold water is freely poured over it. This measure is frequently attended by a temporary restoration to consciousness, but as it only lasts a short time it is of questionable advantage. When meningitis arises in connection with such infectious diseases as scarlet fever, diphtheria, influenza, and the like, Dr. C. K. Mills * suggests that too little attention "is given to the use of agents which are calculated to combat the organisms in the blood and to change the soil in which they flourish. The administration of large doses of such remedies as bicarbonate of potassium, salicylate of sodium, gaultheria, etc., might be successful in preventing the development or limiting the progress and destructive after-effects of an otherwise severe meningitis."

If it is thought desirable to administer antipyretics to reduce the temperature, we consider a combination of quinine (the hydrobromate) and phenacetin, the best; 1 to 3 grains of each may be given, in infective cases, every two or three hours; the patient should at the same time be sponged with cold or tepid water. But in the earliest stage, in children, we prefer a few small doses of tincture of aconite or aconitine for this purpose. The diet in these cases should be of the simplest; milk mixed with iced water is the best food. In the later stages, with much general depression, beef tea, wine and other stimulants and restoratives may be called for. Rectal feeding will be necessary when it is not possible to give food by the mouth. Convalescence in those rare cases that recover must be watched carefully, and every possible care taken to avoid excitement and to maintain a long period of absolute repose; suitable tonic remedies may, after a certain time, be needed.

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* Hare's "System of Practical Therapeutics," vol. iii. p. 308.

THE TREATMENT OF APOPLEXY.

(*Cerebral Hæmorrhage, Embolism and Thrombosis.*)

There are many questions, of great pathological interest and importance, surrounding this subject of cerebral hæmorrhage and disorder of the cerebral circulation, that cannot be referred to, even briefly, in a work strictly limited in its object and purpose as this is. We must here confine ourselves closely to those details which bear, more or less directly, on the therapeutic management of the diseased conditions which arise in consequence of the occurrence of the lesions mentioned in the title of this section.

Apoplexy, which is the name for a clinical, rather than a pathological, conception, refers to a sudden loss or suspension of consciousness and powers of motion.

These may, however, be suspended, as in certain intoxications, without apoplexy; for, in the latter, this loss is assumed to be *sudden*, as by a "*stroke.*"

And again, although apoplexy and cerebral hæmorrhage have been regarded as convertible terms, strictly speaking they are not so; for a small hæmorrhage, in certain districts of the brain, may cause hemiplegia without loss of consciousness; and even in some cases of large hæmorrhages, slowly poured out (ingravescent apoplexy), there is no "stroke," or *sudden* loss of consciousness, but the so-called apoplectic state develops gradually, and it may be some hours before loss of consciousness and motion is complete, and profound coma is established.

Although the apoplectic state is usually caused by the rupture of a cerebral vessel and hæmorrhage into the substance of the brain or on its surface, it may, however, also arise without the existence of cerebral hæmorrhage; and cases have been observed where hemiplegia and coma, and even *sudden* loss of consciousness, have been caused by obstruction to the cerebral circulation, and the cutting off of the blood supply (anæmia) of a certain portion of the brain, without any vascular rupture We must, therefore, admit obstructive anæmia and softening from cerebral embolism, as also a cause of apoplexy; and there is evidence to prove that syphilitic arteritis may likewise give rise to the same phenomena.

As a rule, we have to rely on collateral circumstances in order to enable us to distinguish which of these causes is in operation. An apoplectic seizure, in a person over forty years of age, may, with very rare exceptions, be assumed to be due to hæmorrhage. In younger persons, if we find a history of cardiac valvular disease, there is a presumption in favour of embolism. But we must not overlook the fact that hæmorrhage may result *indirectly* from embolism, owing to the formation of an aneurism on the obstructed artery. If, on the other hand, we find in these younger patients evidences of constitutional syphilis, we may suspect the apoplectic attack to be due to syphilitic arteritis.

Cerebral hæmorrhage from arterial rupture being by far the commonest cause of apoplexy, we must next inquire what is the cause of this hæmorrhage? Disease of the cerebral vessels, chronic arteritis, usually associated with general arterio-sclerosis, and, in Great Britain, often found associated with chronic renal disease (contracted, granular kidney), is the main cause of cerebral hæmorrhage. These morbid changes in the arteries may originate in chronic alcoholism, in syphilis, and in over-exertion—prolonged muscular strain, as in athletic competitions, and severe and sustained physical labour. Old age also naturally brings these degenerative changes in its train. In some instances, we believe, these general arterial changes are determined by hereditary influences, and that the inherited gouty or rheumatic constitution will often be expressed in a disposition to early arterial degeneration. We also believe that malarial and other forms of recurrent pyrexia are apt to lead to degenerative arterial changes.

The much greater frequency with which the occurrence of cerebral hæmorrhage is observed to be associated with chronic gouty kidney, in England than on the Continent, may probably be accounted for by the far greater prevalence of gout amongst the population of the former country. Given the existence of a morbid state of the cerebral vessels, it is easy to see how the hypertrophied heart, and heightened vascular tension, of chronic renal disease, greatly increase the risk of cerebral hæmorrhage from rupture. Charcot and Bouchard have shown that in a great number of cases the hæmorrhage is *directly* due to the rupture of *miliary aneurisms*, that form on the trunk or branches of these diseased vessels.

The following are the most important **symptoms** that accompany and follow an apoplectic seizure. Without any warning, and perhaps while engaged in some action requiring rather more than usual muscular effort, the person attacked with apoplexy falls on the ground, paralysed and unconscious. Sometimes the loss of consciousness may not come on till a few minutes after the paralysis. The loss of consciousness is complete and profound. The face is usually livid or congested; the pupils commonly dilated and insensible; the respiration slow and stertorous; the pulse may be full, slow, and hard; the temperature may fall below the normal, or, in hæmorrhage at the base, it may be high; the evacuations are passed involuntarily; there may be slight twitchings of the muscles, but convulsions are rare; on examining the limbs, more or less complete paralysis of one side of the body will be discovered, and it will be noticed that the cheek of the paralysed side is flaccid and *blown* out during expiration; the head and eyes are often turned strongly to one side. In some cases, the so-called "*ingravescent*" ones, in which we may suppose the hæmorrhage to be slowly poured out, the attack is developed very gradually; and it may be some time before complete loss of consciousness and muscular paralysis are established.

Within the next forty-eight hours, owing to inflammatory changes around the clot, some febrile reaction may occur, and the temperature may rise many degrees, up to 107° or 108°—a very unfavourable sign; and some *rigidity* may be observed in the paralysed limbs.

When the hæmorrhage has been extensive, and very serious injury has been inflicted on the surrounding structures, the coma may deepen, the febrile reaction may be very great, bed-sores may form rapidly, the presence of albumen and sugar may be detected in the urine, and death may speedily ensue.

On the other hand, a fall of temperature on the third or fourth day and a return of consciousness are favourable signs. The subsequent course of the case depends on the extent and site of the lesion. If the lesion is slight the hemiplegia may disappear altogether in a few days or a few weeks. The facial paralysis is usually the first to disappear, then that of the leg, then that of the shoulder and upper arm, and finally, that of the fore-arm and hand. In chronic cases, where improvement is slow to appear, *contraction* of the muscles of the paralysed limbs, most marked in the upper extremity, comes on within eight or ten weeks. Some pain in the affected limbs usually attends the development of these contractions, which are generally permanent.

With regard to a **preventive** treatment of apoplexy, it is scarcely necessary to say that it cannot *openly* be entertained, except in the case of a patient who has already had an attack; for to suggest to a patient that he was in danger of apoplexy would, perhaps, be one of the most certain means of inducing an attack. The mental anxiety and distress which such an announcement would be almost certain to produce would, necessarily, be most prejudicial, and would be calculated to increase, rather than diminish, circulatory excitement. On the other hand, the rational treatment which would be prescribed by any intelligent and practical physician, when consulted by a patient suffering from those degenerative changes, or those constitutional or local diseases which involve the danger of cerebral hæmorrhage, would obviously be devised and directed to protecting him from *all* the morbid tendencies or accidents to which he was exposed. The preventive treatment of apoplexy can, then, only be the rational and appropriate treatment of those morbid conditions which we have mentioned above, and which has been dealt with in other chapters.

The idea of drugging a patient with arsenic, aconite, veratrum viride, digitalis, strophanthus, or strychnine, etc., with the sole view of preventing an attack of apoplexy, with which he may be supposed to be threatened, is to be strongly deprecated.

The **treatment** of cerebral hæmorrhage may be considered under the following circumstances:—First, at the onset of the apoplectic attack, and during the stage of unconsciousness; secondly, during the period of febrile reaction; thirdly, on recovery of consciousness immediately after the attack; fourthly, the treatment of the hemiplegia that usually remains after the attack has been recovered from; fifthly, the measures to be recommended to prevent a recurrence.

(1) The first *indication*, of course, is, in a hæmorrhagic case, to prevent, if possible, the further outpouring of blood from the ruptured cerebral vessel or miliary aneurism. For this purpose the patient should be kept as completely at rest as possible; and all movement or disturbance of the body should be forbidden. He should not be moved from the place in which he has fallen, or only on to a mattress or bed; the shoulders and neck should be raised, but care should be taken not to put a pillow under the back of the head, so as to throw the chin down on the chest, as in that position the pharynx becomes obstructed by the tongue, and stertorous (obstructed) breathing is produced. To avoid this stertorous or obstructed breathing, it has been suggested that the patient should be turned on to the side opposite to the seat of the lesion; but we consider even this amount of movement should, if possible, be avoided; and we have observed the noisy dyspnœa disappear on the

removal of the pillow, which is generally placed at the back of the head, and which throws the chin down on to the chest. All tight clothes must be removed; and it is often necessary, in order to avoid disturbance of the patient, to cut them away. When the coma is very profound, and the paralysis general, the case must be regarded as hopeless; and the exhibition of any excessive zeal or meddlesomeness should be avoided, especially when the patient is advanced in years, as will most frequently be the case. If, however, the case has not this altogether hopeless aspect, and the patient is not very advanced in years, the question of more active interference must be considered. Shall we, or shall we not, bleed the patient? In the case of an old and feeble person, we may at once decide not to do so; and in younger persons, if there should be any grounds for believing that the apoplectic attack may be caused by cerebral anæmia, and softening from embolism, or thrombosis, we should also put aside the idea of the removal of blood as only likely to do harm. If there are signs of cardiac debility, and a pulse of low tension, again we should not think of bleeding.

If, however, in a still vigorous man, we find a full, hard pulse of high tension, a hypertrophied left ventricle, a flushed face, pulsating carotids, and an accentuated aortic second sound, then it can hardly be wrong to open a vein in the arm and let out a full stream of blood, so as to rapidly reduce the arterial tension, and so favour the cessation of the hæmorrhage into the brain, by promoting the formation of a coagulum at the bleeding point. The older physicians tell us that patients, when bled, used to emerge from their apoplectic coma as the blood was flowing; and there seems no good reason for doubting this, as we may suppose they frequently had to deal with such cases as we have just described.

Fagge, who is, on the whole, averse from bleeding, points out, however, that, in cases "in which the symptoms of cerebral hæmorrhage are slowly ingravescent," not only should the patient be kept absolutely still, and the administration of brandy, and even ammonia, strictly forbidden, the limbs being kept warm by friction with hot flannels, but, "as reaction comes on, the question of blood-letting must be most seriously weighed . . . it is possible that free venesection, just at the time when the vigour of the circulation is being re-established, may, by lowering the pressure in the cerebral vessels, prevent further effusion of blood." *

There is, however, another method of lowering arterial tension, and of relieving cerebral hyperæmia, which is almost universally adopted, and that is the administration of a strong purgative. Five to 10 grains of calomel are thrown on the tongue, or a drop or two of croton oil, mixed with 4 or 5 drops of glycerine or olive oil, may be dropped into the mouth. But this even we should not do in old, debilitated persons, with a weak heart and a feeble pulse. If the bowels are loaded, in such cases it is best to clear them out by means of an enema of olive oil and turpentine, mixed with warm soap and water. An ice-bag may be applied to the head, and hot-water bottles to the feet. The hot bottles must be well protected, owing to the tendency, in these cases, to the formation of blisters and sloughs. The tendency on the part of anxious friends to feed the patient by the mouth, when he is really unable to swallow, must be restrained; and they should be informed of the danger of the passage of food and drink into the air-passages; and that no harm can arise from abstention from food for a day or two. There is no objection to rectal feeding, if the general condition of the patient points to the need of nourishment or stimulant. If the mouth is dry it may be moistened with a feather dipped in glycerine and water.

The evacuation of the bladder must be seen to; and the bed should be examined, to see that it is smooth and even, and that there is no undue pressure

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* "Principles and Practice of Medicine," vol. i. p. 595.

or friction of the skin of the back, as bed-sores are very readily established in these cases.

(2) During the period of febrile reaction it is important to prevent, if we can, the spread of inflammatory reaction in the brain substance, and to hasten the absorption of the clot. Osler thinks "aconite may be indicated" at this period; but highly as we regard the anti-febrile properties of this drug in the inflammatory affections of childhood and youth, we have rarely seen it act favourably in the aged. Dujardin-Beaumetz, who disapproves of bleeding in the attack, commends the application of leeches, or the letting of blood, at this stage; while Niemeyer, who approves of venesection under the conditions we have already set forth, condemns it in this stage, as "superfluous and dangerous." The best course to follow is to keep up the application of ice to the head, and to purge freely, and to avoid giving stimulants.

We do not see any likelihood of ordinary hæmostatics, such as acetate of lead, gallic acid, or ergot, being of use in arresting cerebral hæmorrhage, more especially as the patient is usually unable to swallow; and it is difficult to know whether the hypodermic injection of ergotinine would do harm or good; so far as it tends to raise arterial tension by causing contraction of the arterioles generally, it would seem likely to do harm; whereas, on the other hand, by causing contraction of the bleeding vessel, or the trunk from which it proceeds, it might favour the arrest of the hæmorrhage; it must, however, be borne in mind that it cannot act on the walls of diseased arteries as it does on healthy ones. It might, however, be worth trying in ingravescent cases, as they are generally fatal as at present managed.

When the apoplectic attack is due to softening from embolism or thrombosis, there is little to be done by treatment beyond keeping the patient absolutely still and quiet. Bleeding is counter-indicated, as it lowers tension, favours coagulation, and tends, therefore, still further to depress the nutrition of the brain substances. Free purgation is also to be avoided, and a gentle aperient action only sought for. Should there be irregularity and feebleness of the heart's action, stimulants, such as ether and ammonia, may be given, and some recommend small doses of digitalis.

In thrombosis from syphilitic arteritis (which is met with usually in males between 20 and 40 years of age, and which may cause hemiplegia without loss of consciousness), anti-syphilitic medication must be vigorously applied; 20 to 30 grains of potassium iodide must be given three times a day, and mercurial inunctions freely used. "These are the only cases of hemiplegia in which we see satisfactory results from treatment" (*Osler*).

Embolic cases associated with cardiac vascular disease are also not always attended by apoplexy. *Hemiplegia* may occur without loss of consciousness, and in such cases the patient should for a time be confined to bed and kept on a simple but nutritious diet, and if the area of softening is limited and its situation comparatively unimportant, complete or partial recovery may be established.

(3) On the recovery of consciousness after an apoplectic seizure, the patient requires the greatest possible care and cautious management, in order to avoid a recurrence of hæmorrhage and to favour the subsidence of the cerebral inflammation and irritation excited around the clot. The diet must be very light and unstimulating, and consist of milk and farinaceous foods chiefly. Cold applications to the head must still be maintained, free action of the bowels must be kept up, and good is sometimes obtained from the derivative action of mustard plasters or blisters to the nape of the neck. Some give small doses of aconite with potassium bromide at this time, and later on the bromide combined with iodide, with the view of promoting the absorption of the extravasated blood.

(4) The treatment of the **hemiplegia** and the rigidity and contractions of the muscles which follow the apoplectic attack is rarely attended by any very satisfactory results.

At first nothing more should be done beyond gently rubbing the paralysed limbs once or twice daily, with the object of maintaining the nutrition of the muscles and preventing, if possible, the supervention of contractions. Afterwards electricity may be applied to the muscles of the affected limbs. While some recommend that electrical stimulation of the muscles should be commenced about a fortnight from the seizure, others consider that a period of not less than two months should be allowed to elapse, and that it should be immediately discontinued if its application is observed to be attended by any faintness, giddiness, headache, sickness, or other uncomfortable feeling. It has been stated that electricity does little or no good unless the muscular contractility is found to be diminished (*Reynolds*), and that after the development of contractions it is useless (*Osler*), and then passive movement and rubbing are the best measures to adopt.

The *faradic* current should be used for the purpose of stimulating the defective muscular contractility, and it will often be found, after a few weeks, to restore this, while the muscles at the same time become less wasted and the limb regains its natural warmth. The tendency to contraction of the fingers on the palm may be diminished by faradisation of the extensor muscles of the fingers. Some physicians prefer to begin the electrical treatment with a weak continuous current, and only resort to faradic stimulation later on. Nothnagel and others have reported good results, such as increase of power and diminished rigidity of the paralysed muscles, from the application of a weak galvanic current to the head. The poles are sometimes applied behind the ears; sometimes one pole is applied behind the ear and one on the forehead, and sometimes one large electrode is placed on the

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forehead and the other over the occiput. Beginning with four or five Leclanché cells, the current may be increased up to ten or twelve cells. The poles should be gradually applied, and the current maintained for not longer than three minutes at a time, and the poles must never be suddenly reversed.

The diet during this period must be light and nutritious, but not exciting. It is best to avoid animal food, or at any rate to limit it to a little chicken or fish. No alcoholic drinks, except for exceptional reasons, should be permitted, and strong tea and coffee are best avoided. But the digestive peculiarities of each patient must be studied, and no attempt made to carry out a hard-and-fast rule as to diet. A strictly vegetarian diet, with milk, has been advocated, and this, where it agrees well, is sound advice, but where, from individual peculiarities, this is not the case, it is worse than useless to insist on such a strict *régime.* General tonic treatment may be needed, as in convalescence from other illnesses, but in those cases it should be attempted with great caution and care, lest any cerebral irritation be re-excited. The bowels must be especially attended to, and regular daily evacuations secured. All brain work must of course be forbidden, and everything that can excite the emotions or irritate the temper—and such patients are apt to display periods of irritability—must be kept at a distance. If the patient is restless at night and sleepless, it may be necessary to give some bromide at bed-time, with which a little henbane may, if necessary, be combined.

When the hemiplegia has become chronic, and especially when contractions have developed, there is perhaps little use in submitting the patient to any further electrical or other treatment. But many well-to-do patients do not readily reconcile themselves to this "masterly inactivity," and it is in such instances that a course of baths, combined with electrical treatment and massage, at such thermal stations as Gastein, Ragatz, Wildbad, or Plombières, may be recommended. Such courses cannot cure or remedy what is incurable and irremediable, but they induce an effort to lead an out-of-door life and to be much in the health-restoring open air of those pleasant resorts, and it has been often observed that both cerebral and spinal paralyses do improve in such places, after treatment therein. Niemeyer suggests that some of this improvement may possibly be due to a favourable influence exerted by the baths on the inflammation around the clot and on that part of the paralysis due to it.

(5) Finally, we have to consider what are the best rules to enforce on such persons as have had an apoplectic seizure, in order to **prevent** a recurrence. We have already pointed out the kind of diet best suited to such patients—white meats, green vegetables, and ripe fruits, and the avoidance of butcher's meat, fats, and saccharine substances—and, above all, *great moderation* in eating and drinking should be enforced. As the bowels are likely to be sluggish, a daily laxative is advisable, as all straining at stool is particularly to be avoided. All kinds of emotional excitement, and especially attempts at sexual intercourse, must be strictly forbidden. Gentle and regular exercise in the open air, stopping short of fatigue, is advantageous. The functions of the skin should be promoted by warm baths and frictions. If the patient should be gouty, a mild course of alkaline saline mineral waters may occasionally be useful, but these may be taken at home, and need not involve the trouble of a visit to a Continental spa.

In short, free elimination by all the excreting organs should be promoted. Co-existing renal, cardiac, or arterial disease must be treated on the general principles already laid down in former chapters.

It would be premature to occupy ourselves with certain surgical suggestions that have been advanced, with respect to the treatment of cerebral hæmorrhage, as they can hardly be said as yet to have entered the sphere of clinical therapeutics. We are living in an age especially characterised by surgical interference and activity—an age which will probably be known in the future history of medical science as "the surgical age." We must not be surprised that somewhat bold proposals should have emanated from enterprising surgical minds in connection with the treatment of apoplexy. At present we propose to reserve our opinion as to their merits until someone has been hardy enough to test them practically. We refer especially to ligaturing or compressing the carotid for the purpose of arresting cerebral hæmorrhage, and to trephining the skull for the removal of a blood clot, or a hæmorrhagic effusion in the substance of the brain, or in the ventricles.

ADDITIONAL FORMULÆ.

Aperient powders in meningitis.

℞ Hydrargyri subchlor., 7½ to 12 grains.
Pulv. rad. jalapæ, 15 to 30 grains.
Sacchari alb., 75 grains.

M. et div. in pulv. 6. A powder every hour.
(*Bamberger.*)

For violent headache in meningitis unrelieved by local bleeding or application of ice.

℞ Morphinæ hydrochlor., ¾ grain.
Sacchari alb., 75 grains.

M. et div. in pulv. 5. One every three hours until a sedative effect is produced.
(*Bamberger.*)

Mixture in meningitis.

℞ Potassii iodidi, 15 to 30 grains.
Aquæ menthæ pip., 5 drams.
Aquæ destill. ad 3 oz.

M. f. mist. A dessertspoonful three or four times a day.
(*Henoch.*)

For tubercular meningitis with broncho-pneumonia.

℞ Potassii iodidi, 15 grains.
Infusi ipecac. (2 to 1,000) ad 2½ oz.
Syrupi simp., 3 drams.

M. f. mist. A teaspoonful every two hours. (*Widerhofer.*)

For great depression in meningitis.

℞ Camphoræ, 7½ grains.
Emuls. amygdal., 1 oz.

M. Half to be given by the rectum. (*Bamberger.*)

For convulsions in tubercular meningitis.

℞ Chloral hydrate, 7½ to 15 grains.
Dec. althææ, 3 oz.

M. Half to be given by the rectum. (*Widerhofer.*)

For apoplexy after all active symptoms have ceased.

℞ Hydrarg. perchlor., 1 grain.
Sodii chlorid., 20 grains.
Glycerini, 1 oz.
Aq. destill. ad 8 oz.

M. f. mist. A dessertspoonful, gradually increased to a tablespoonful, thrice a day immediately after meals. (*Engel.*)

For hemiplegia.

℞ Strychninæ, ½ grain.
Acidi acetici, 2 drams.
Sacchari alb., 3 drams.
Aquæ destill. ad 2 oz.

M. f. mist. A teaspoonful night and morning. (*Magendie.*)

For hemiplegia after apoplexy.

℞ Zinci phosphidi, 3 grains.
Extr. nucis vom., 10 grains.

M. et div. in pil. 30. One three times a day. (*Hammond.*)

CHAPTER II.

THE TREATMENT OF DISEASES OF THE SPINAL CORD.

TABES, OR LOCOMOTOR ATAXY (*Sclerosis of Posterior Columns*).—Characters, Symptoms, and Course—Causation—Relation to Syphilis—Indications for *Treatment*—Anti-Syphilitic Remedies—Arsenic—Nitrate of Silver—Corrosive Sublimate—Phosphorus—Gold Salts—Ergot—Calabar Bean—*Treatment* of the *Lightning Pains* and *Gastric Crises*—Value of Counter-irritation—Ice-bag—Value of Electricity—Nerve-stretching—Suspension — Hydrotherapy — Baths and Massage — Climate, Food, etc.

INFANTILE PARALYSIS (*Acute Atrophic Spinal Paralysis—Poliomyelitis Anterior*).—Nature, Course, and Symptoms—*Indications for Treatment* in the Acute Stage—Counter-irritation—Antipyretics—Spinal Ice-bag—Ergot—Potassium iodide and Mercury—Sedatives—Treatment in later Stage—Strychnine—Mechanical Exercises—Massage—Electricity—Orthopædic Appliances.

PARAPLEGIA AND THE MORBID CONDITIONS ASSOCIATED THEREWITH.—Its Causes—*Myelitis*, etc., etc.—Symptoms in *Acute Myelitis*—In *Chronic Interstitial Myelitis*—In *Compression* Cases—In *Spastic Paraplegia*—Indications for *Treatment*, which is usually palliative rather than curative—Counter-irritation—Ice-bag—Value of Aperients—Attention to Vesical and Rectal Troubles, and to the Prevention of Bed Sores—Ergot—Potassium Iodide—Electricity—Thermal Baths—Hydrotherapy—Strychnine—Treatment of *Compression* Cases—Rest and Suspension—Antituberculous Treatment—Surgical Treatment—Treatment of Spastic Paraplegia.

PROGRESSIVE MUSCULAR ATROPHY, etc. Additional Formulæ.

DUJARDIN-BEAUMETZ has said that the treatment of "diseases of the spinal cord is one of the darkest chapters in therapeutics;" and it certainly is remarkable, that while there has been so great an amount of light thrown on the nature and classification of these diseases by modern pathological investigations, yet, so far as their therapeutics is concerned, the result has rather been to demonstrate how useless and futile it is to attempt to discover any causal indications for their treatment. Apart from syphilis, which is so often invoked as affording such an indication, the treatment of these lesions is almost wholly limited to alleviating, or diminishing, or limiting the intensity of their effects; the lesions themselves being regarded as beyond the reach of curative agents.

TABES OR LOCOMOTOR ATAXIA.
(*Sclerosis of Posterior Cords.*)

This readily recognisable disease, named by Duchenne *progressive* locomotor ataxy, from its tendency to a steadily progressive advance, is chiefly characterised by a curious disorder of muscular movements, affecting usually, in the first place, the muscles of the lower extremities, and, in some cases, extending, sooner or later, to those of the upper limbs. The muscles lose, to a greater or less extent, their power of co-ordinate action; they are not paralysed—they can lift weights, and can voluntarily offer a considerable amount of resistance to extension or flexion, but they lose, in a progressive manner, the power of harmonious co-operation for definite ends.

The peculiar gait of the ataxic patient is well known: the feet thrown outwards and upwards as he walks, and then brought down on the ground with an exaggerated stamp; and his inability to walk along a straight line, or with his eyes closed, or to turn sharp round, without staggering. Disturbances of sensation are also common, such as numbness, creeping, and a curious retardation in the transmission of sensory impressions, especially of pain. Irritability or paresis of the bladder, and gradual impairment and ultimate loss of sexual power generally, accompany these other symptoms. Loss of knee-jerk is one of the earliest symptoms. A particular form of this disease has been described, which is complicated with paraplegia, and is named "*ataxic paraplegia;*" in such cases the sclerosis has extended from the posterior to the lateral columns.

A symptom, which may long precede the other manifestations of this disease, or it may accompany them, is the occurrence of the so-called "*lightning pains*"—pains of exceedingly brief duration and frequent recurrence, suddenly shooting through the limbs and other parts of the body. They vary greatly in intensity in different patients; sometimes they are most agonising, and their occurrence is a perfect terror to the sufferer. They are apt to occur at night. They may be induced by over-exertion, mental or physical; and some have observed that they are prone to occur during cold, wet, and windy weather.

There is another painful symptom apt to occur in this disease, and termed by French physicians "*crises gastriques.*" These consist in very severe attacks of gastric pain, attended usually with vomiting of very acid fluid. Pains in the bladder and rectum may also occur. The paresis of the bladder may lead to cystitis; and there is generally obstinate constipation, with distressing flatulence.

Various *ocular* symptoms have been noted; some dependent on paresis of the ocular muscles, such as strabismus, ptosis, diplopia, contracted pupils; and others on optic atrophy. This last may go on to complete blindness; and when this is the case there is rarely any ataxia; such cases have been termed tabes without ataxia! Charcot's joint-disease, and perforating ulcer of the foot, are amongst the rarer complications of this disease.

Though rarely or never cured, it is a disease that runs a very irregular course. The pre-ataxic state, distinguished by lightning pains, loss of knee-jerk, and optic atrophy, may last an indefinite period; and in some instances, as we have already said, ataxia never occurs. The ataxic symptoms may advance slowly, and sometimes remain stationary for many years, or appear to be arrested. Sometimes exacerbations occur, and the disease will advance with great rapidity.

Some so-called "acute" cases run a rapid course from the first. The disease rarely itself causes death;

in advanced stages, when the patient becomes bed-ridden, he is apt to succumb to some intercurrent malady.

The next point that chiefly concerns us here is the **causation** of this disease; what is the cause of *sclerosis*, or *grey induration*, or *chronic interstitial myelitis* of the posterior columns of the cord, which is the chief anatomical lesion in tabes? It has been found to be of far more frequent occurrence in males than in females—the estimate of some authorities being as great as 10 to 1. It rarely occurs before twenty, or begins after fifty. The tendency to regard **syphilis** as the chief causal agent in this malady is almost universal amongst competent authorities. Erb found that of 300 cases of tabes in private practice, 89 per cent. had had syphilis; and Ross, out of 20 cases, was able in one only to exclude syphilis as an antecedent.

Other causes to which this disease may be attributed are exposure to chill, as sleeping on damp ground; over-exertion and fatigue, as in long military marches; venereal excesses; and occasionally to traumatisms.

We must be content with the foregoing brief reference to the nature and causation of this interesting disease, as an introduction to a consideration of its **treatment.** The *indications* are to arrest, if possible, the progress of the disease; and to relieve the painful and distressing symptoms. We must admit, with Prof. Allen Starr,* that as this disease "depends upon certain changes in the connective tissue and nerve elements of the spinal cord, which are permanent in character, complete recovery in any stage is impossible; all that therapeutic measures can hope to accomplish is to arrest the progress of the disease at the point reached, so that further symptoms may not develop." In estimating the value of any mode of treatment in this disease, we must bear in mind its natural tendency to slowness of progress, to quite long stationary periods, and to the frequent spontaneous remission, or even disappearance, of certain symptoms.

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* Hare's "System of Practical Therapeutics," vol. iii. p. 259.

The propriety of submitting the patient to vigorous *anti-syphilitic* treatment is the first question to be considered, as this alone, in the majority of cases, responds to the causal indication. Most authorities concur in stating that the few cases of cure of this affection they have met with have followed the administration of anti-syphilitic remedies. In the majority of cases they will, of course, fail, because, even when due to syphilis, most cases come under treatment too late to effect a cure, although the progress of the disease may be retarded. In the later stages of the disease, they may be actually prejudicial; and it is precisely in those stages that we can expect little benefit from any remedy. This line of treatment is also counter-indicated in the class of cases in which optic-nerve atrophy is the initial symptom, as mercury has been found to hasten and not retard this process.

Anti-syphilitic treatment, however, affords a chance which should never be overlooked in treating a case of tabes, and the earlier we have the opportunity of applying it the better are the results we may expect. Whitla believes, and we are disposed to agree with him, that potassium iodide often proves a valuable remedy, even in cases in which there is no reason whatever to suspect a syphilitic taint. It seems to exert a remedial effect on the lightning pains. Osler thinks that it is only when the syphilis has been of recent date—when the symptoms develop within two years of the primary affection—that there is a possibility of arrest by mercury and potassium iodide.

The treatment should be carried out in the following manner:—About ½ a drachm of mercurial ointment, mixed with an equal part of lanoline, should be rubbed in daily into the inside of the thighs, or in the axillary regions, or over the abdomen; the part of the surface selected having been previously washed with warm water and soap, and then with alcohol.

About half an hour should be devoted to the inunctions, and a flannel bandage should be firmly applied afterwards to promote the complete absorption of the drug. The effect is promoted by a warm bath (87° to 90°) for fifteen minutes daily before the inunction. Salivation must be avoided. When there are difficulties in carrying out this plan, the advantage of which is that it does not disturb the digestive functions, mercury must be given internally. The perchloride, in doses of $\frac{1}{48}$ to $\frac{1}{32}$ grain, or the red iodide, in doses of $\frac{1}{12}$ to $\frac{1}{6}$ grain in a pill, may be given thrice daily. At the same time, potassium iodide should be given in gradually increasing doses, from 10 to 60 grains three times a day, in 2 oz. of some bitter infusion an hour before meals. The larger doses should not be continued for more than three or four weeks at a time, but smaller doses may be given for two or three months longer.

When this mode of treatment, or any modification of it which the patient may tolerate better, is followed by decided improvement, it is advisable to return to the mercurial inunctions for two or three weeks at a time, at intervals of three or four months.

Apart from anti-syphilitic treatment, the drugs that have received the greatest amount of commendation are arsenic, nitrate of silver, and corrosive sublimate. Professor Starr prefers arsenic and corrosive sublimate. The former, as one of the best nerve-tonics, he thinks may possibly retard the disintegration of nerve-fibres in the sclerotic areas of the cord; $\frac{1}{40}$ grain of arsenious acid should be given three times a day. Corrosive sublimate is believed to retard the progress of connective-tissue inflammations; $\frac{1}{50}$ grain may be given thrice daily. These two drugs may be used alternately.

The use of *nitrate of silver* is widely advocated, as having produced great improvement in many cases. It is given in doses of $\frac{1}{4}$ grain three times a day. It is best administered made into a pill with kaolin. Osler has noted that it allays the attacks of pain and lessens the liability to them. Some physicians have given as much as 1 grain three daily. A great drawback to the employment of this drug is that not only does it tend, after long use, to produce a blue discoloration of the skin, but it is also very apt to cause gastric disturbance. To avoid the latter, it has been suggested that larger doses of *oxide* of silver answer as well and do not produce this effect. Any appearance of discoloration of the skin should lead to the immediate suspension of the drug.

Dujardin-Beaumetz prefers phosphorus. He says the patients report great *subjective* amelioration under its influence, although little or no *objective* improvement may be observable.

As a substitute for nitrate of silver, over which it certainly possesses the advantage of causing no staining of the skin, the double *chloride of gold and sodium* has been used and praised by Bartholow, Whitla, and others. Its use is said to cause absorption or atrophy of morbid connective-tissue formations. It is given in doses of $\frac{1}{30}$ to $\frac{1}{12}$ grain in pills three times a day. Charcot advocated the administration of *ergot* or *ergotine*, not continuously, but for four days in every week. Its use has been attended in early cases with temporary improvement. Considerable improvement has also been observed to follow the prolonged exhibition of *calabar bean* or eserine.

The **lightning pains** and the **gastric crises** require special treatment.

Antipyrin, phenacetin, and exalgin are good remedies with which to combat the lightning pains. They should be given in the ordinary doses, and it is a good plan, as pointed out by Professor Starr, to give these drugs in alternation, each a week at a time, so as not to require to increase the dose. Osler thinks the analgesic power of the first-mentioned has, in this disease, been greatly overrated. Dujardin-Beaumetz, on the contrary, is, as usual, a warm advocate of antipyrin; he recommends 30 to 45 grains a day, or 15 to 20 grains if given hypodermically—as he also suggests. Cannabis indica has been found useful in relieving these pains. When these pains are associated with increased arterial tension, Osler strongly advises the prolonged use of nitro-glycerine in increasing doses. He has found it of great service in allaying the pains and diminishing the frequency of the crises. Starr has found sodium salicylate, in 10- to 20-grain doses, sometimes relieve the pains when other drugs have failed. A mixture of belladonna and chloroform liniment rubbed in along the spine is sometimes a useful expedient. But when all other drugs fail in relieving these pains, but not until then, we shall be compelled to have recourse to hypodermic injections of morphine; but there is great danger lest the ataxic patient should become a victim of the morphine habit. Other measures have been suggested for the relief of these pains, to which we shall refer immediately, when we have finished with the consideration of the drug treatment of this disease.

We have only to notice the medicines suitable for the relief of the gastric crises. As dyspeptic states often co-exist, it will be often necessary to prescribe bismuth with alkalies and hydrocyanic acid. Small doses of extract of opium or of Battley's solution, taken when the stomach is empty, twice or three times a day, will be useful. Mustard plasters to the epigastrium, and if necessary morphine hypodermically, will also have to be used. Great care should be taken that the bowels are completely relieved each day, either by some simple aperient, such as the confection of senna, one or two cascara tabloids, or the compound *liquorice* powder; if these fail an enema of tepid water or salt and water may be employed.

Bladder symptoms also require attention, and when there is a tendency to incomplete evacuation of the urine the patient should be instructed to use a catheter.

We now turn to the various methods of treatment that have been suggested for the relief of this affection other than the use of drugs.

Active *counter-irritation* has been advocated, in order to relieve irritation and congestion of the spinal cord, and either blisters, or stimulating liniments, or Paquelin's thermo-cautery or dry-cupping, or the faradic brush, may be used for the purpose. These measures may also be applied to painful parts, and, combined with complete rest in bed, have been found useful in relieving the lightning pains. An ice-bag to the spine for a short period has also been found beneficial.

Blisters on the back are undesirable, on account of the tendency to bed-sores in spinal diseases; and it should be remembered that the cutaneous sensibility in these patients is often greatly impaired, so that the effects of hot applications have to be carefully watched.

The value of **electricity** in the treatment of tabes is very differently estimated by different authorities. Osler and Dujardin-Beaumetz think it of very little benefit. Erb considers the application of the continuous current to the spine is attended with more or less improvement in the majority of cases. The applications are made once daily for three to six minutes, and he uses only a moderate number of cells. Professor Starr agrees with Gowers and Möbius "that as a therapeutic agent in locomotic ataxia it is useless, either as a direct agent affecting the progress of the disease or as a means of treating individual symptoms."* Professor Rockwell† takes a somewhat different view. He says: "This disease is frequently relieved but never cured by electrical treatment. The discrepancies in the statements of the effect of electricity in *true* locomotor ataxia are due to the fact that symptoms which are more or less transient in their nature (often caused by spinal concussion) are mistaken for symptoms that come on slowly after long years of incubation. . . . In regard to electrical applications, the direct treatment of the spine is, perhaps, the most important, and for the possible relief of any symptoms in old cases of spinal sclerosis I prefer strong ascending currents. In cases dependent on concussion, or those in which an irritative condition is believed to be present, the descending current is to be preferred. What is needed is that as strong a current as possible be passed through the cord. . . . To get the best effects the electrodes should be rather large and some distance apart. . . . General faradisation is a most useful procedure for the relief of symptoms in not a few cases. This it does by its general effects upon the periphery, and by making the applications thorough—from the head to the feet—the lightning-like pains that are so distressing are often most markedly relieved. By the use of the wire brush to the integument the sensory nerves are subjected to severe stimulation, which exerts on the cord an indirect effect of a beneficial nature." We agree in the main with Professor Rockwell's conclusions.

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* Hare's "System of Practical Therapeutics," vol. iii. p. 263.
† Hare's "System of Practical Therapeutics," vol. i. p. 191.

Stretching the sciatic nerves for the relief of the lightning pains has been practised, and although benefit has followed in some reported instances, it is an operation not unattended with danger, and one that cannot be recommended.

Suspension, a mode of treatment of tabes which has proved to be not unattended with danger, from which much was expected, has already been, as Osler says, "practically abandoned." Whether other authorities will agree with him in the opinion that "it was unreasonable from the outset, either on therapeutic or scientific grounds, to hope that by such a measure permanent changes could be induced in the pathological condition," is questionable; or that the benefits observed from its application "were due in great part to suggestion and to psychical effects." * Many cases have been reported of great amelioration following suspension—diminution of pain, re-establishment of control over the bladder and rectum, restoration of sexual power, and considerable improvement in the gait. Return of knee-jerk is said to have occurred during the treatment. Whitla says: "There cannot be a question that it has given better results than all other treatments in this practically incurable affection."* Professor Starr states that in his own experience of its application in twenty cases there is now, at the end of two years, only one patient out of the twenty who considers it worth while to keep this treatment up. He sees no objection to its employment, but does not think it destined to become a permanent method of treatment of tabes. There can be no doubt that experience has not justified the extravagant claims that were made on behalf of this method; and the occurrence of several deaths from strangulation did much to discredit it.

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* "Practice of Medicine," p. 847.

In conclusion, we must consider the efficacy of those still more general methods of treatment—hydrotherapy, baths and massage, climate, food, etc.

In considering the applicability of **hydrotherapy** to the treatment of tabes, it must be borne in mind that both cold and hot baths are injurious—baths below 65° and above 90° F.; but baths and douches of a temperature varying between 70° and 90° F. are often serviceable. Hot baths will relieve pain, perhaps, more quickly than anything else; "but the ultimate effect of a succession of hot baths is to increase the rapidity of progress of the disease, and to intensify the symptoms" (*Starr*). Of the various methods of applying tepid water the following are especially recommended:—*Spinal douche,*—a stream of water, of a temperature varying from 90° to 70°, and of some force, should be directed from a tube along the whole length of the spine for ten seconds daily; *sponging* the spine while the patient sits on the edge of the bath, and at the end of the sponging, sudden alternations from heat to cold, 90° to 70° F., may be employed. After either of these applications the patient should be rubbed briskly with some warm towels. A *full bath,* at 90° for twenty minutes, should be used daily, while a course of potassium iodide is being administered.

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* "Dictionary of Treatment," p. 472.

The object of these processes is to act on the spinal circulation, "either by affecting the calibre of the vascular system in general, or by producing such peripheral irritation of the skin as to cause reflex vaso-motor effects." Thus the circulation in the cord is stimulated, venous or arterial congestion is relieved, elimination of waste substances is promoted, and nutrition is improved. A period of six or eight weeks, twice or three times a year, may be thus wisely devoted to bath treatment; baths should not be continued, uninterruptedly, for long periods at a time.

Tepid packs to the abdomen or extremities often prove most useful in promptly relieving the crises and the lightning pains. Flannels wrung out in hot water are applied, covered with oil-silk.

This kind of treatment can rarely be carried out satisfactorily at home, but it can be applied in any well-organised hydropathic establishment.

Many of the thermal spas on the Continent are visited by ataxics for this purpose. Little importance need be attached to the composition of the water—everything to its mode of application. Much, too, seems to depend on the bath being situated in a moderately bracing, or warm and dry, locality. To the sub-Alpine climate of Gastein, and its charming surroundings, is doubtless attributable much of the benefit derived from bathing in its tepid water; at Wildbad and at Ragatz also we get the advantage of forest and mountain air, and a warm and dry atmosphere. At Nauheim and Rheme we find salt-baths, rich in carbonic acid, and skilful physicians to apply them.

In France the patronage of Charcot and others has given to *Lamalou* a great reputation for the treatment of these cases. Its springs are very feebly mineralised, but they are of the right temperature, viz. between 75° and 90° F. Néris and Balaruc also enjoy a somewhat similar reputation.

Massage is of service in these cases. Deep massage to the muscles of the back, in the early stages, favours the spinal circulation, and tends to relieve any congestions which may exist. Applied at night, it often relieves insomnia, and prevents attacks of pain; with this object in view, the patient should be counselled not to lie on his back, as the dorsal decubitus favours spinal congestion. In advanced stages also massage is of service, for, by promoting venous return, it is a help to nutrition, and of comfort to the patient.

As to *diet*, the chief considerations are to adequately maintain the nutrition without disturbing the digestive functions of the patient. As generous a diet should be prescribed as the patient can comfortably digest; and any digestive feebleness should be carefully studied, and the diet adapted to it accordingly. When they are readily digested, a free consumption of fats should be encouraged, such as butter, bacon, cream, or cod-liver oil, for a tendency to emaciation is usually encountered in chronic cases. Water in abundance is useful for purposes of elimination; and light wines with water, or light beer, may be permitted; also tea and coffee, if they do not lead to digestive disorder.

With regard to *exercise*, it is no doubt wise, when there are any acute symptoms or any signs of spinal congestion, to enforce absolute rest in bed; but in tho very chronic cases it would be unwise in the extreme to sequester such patients from their avocations and business. We have known many ataxics who have worked, and worked well, for many years in commerce and in literature, their symptoms remaining almost stationary. We should caution such patients against incurring any fatigue. Even in advanced cases, as lying on the back favours venous congestion of the spine, we should encourage sitting up and moving about so far as possible.

An agreeable and pleasant *climate* is always an advantage to ataxic, as well as to other, invalids; and, when it is practicable, change to a southern resort in winter should be advised. Madeira, Teneriffe, the Azores, and some places in the West Indies, are genial climates to winter in, where much time may be spent out of doors. For those who do not want to go so far, Biarritz, or the stations on the Riviera, answer fairly well. A sea voyage has been advised, but we should doubt its utility, except in very favourable circumstances. Ataxic patients should clothe warmly, and should avoid all excessive mental, as well as physical, exertion.

THE TREATMENT OF INFANTILE PARALYSIS.

(*Acute Atrophic Paralysis. Acute Infantile Spinal Paralysis. Polio-myelitis Anterior.*)

These various names have been applied to an affection of the spinal cord, which occurs usually, but not invariably, within the first three years of life, and was formerly known as "infantile paralysis," or "essential paralysis of infancy." Its true nature as a **myelitis,** affecting the grey matter of the anterior cornua of the cord, has only been known within a comparatively short period.

This curious disease, the cause of which is entirely unknown, comes on suddenly, and the paralysis reaches its maximum quickly, even within the space of a day. Its onset is usually attended with some pyrexia, and the temperature rises to from 101° to 103° F. Occasionally, but rarely, the child may be attacked with convulsions. One or more limbs may be found paralysed, the distribution and extent of the paralysis being very variable. Certain groups of muscles, especially in the upper limbs, are liable to be affected together, and the paralysis rarely affects all the muscles of a limb. This is accounted for by the fact that groups of nerve-cells are involved in the disease, "which preside over certain muscles acting functionally together." The affected limb may not, at any rate at first, show any obvious, visible change, but atrophy rapidly sets in, and the muscles become flaccid, soft and flabby. Generally, after eight or ten days, the "reaction of degeneration" may be detected. The muscles do not react to the faradic current, but their susceptibility to the constant current is increased. For a time the paralysis remains stationary, and then gradual improvement may set in; but complete recovery is exceptional, and permanent paralysis of groups of muscles usually remains. Now that the anatomical conditions of the disease are known, we can hardly expect any other result, for when the large motor cells of the anterior cornua are thoroughly disintegrated, their restoration is impossible. There are no disturbances of sensation, nor are the vesical or rectal functions troubled. A remarkable consequence of this disease, when the paralysis persists, is the extreme wasting of the limb and the arrest or retardation of the growth of the bones. From this and other causes, such as *contracture* of the muscles, serious deformities are apt to arise, such as forms of talipes and shortening of limbs; and, in some instances of paralysis of the deltoid, the head of the humerus falls away from the glenoid cavity.

We have already said that the cause of this disease is unknown, but the chief anatomical condition is a myelitis affecting the anterior cornua, most commonly in the cervical or lumbar enlargements, and leading to atrophy of the anterior cornua and disappearance of the large motor cells in the affected part of the cord. There is also atrophy of the corresponding anterior roots of the spinal nerves, and the wasted muscles undergo slow fatty and sclerotic changes.

This brief account of the nature and symptoms of *acute infantile spinal* paralysis will enable us to enter profitably on the consideration of its *treatment.*

The **indications for treatment** will depend on whether the child comes under observation at the onset of the acute attack, which is comparatively rare, or when the acute affection of the spine is practically over, which it probably is at the end of a week. In the first case, measures must be adopted to influence, if possible, the acute inflammation in the cord, to lessen its intensity, and limit its extent. In the second case, the chief object of treatment will be to maintain the circulation and nutrition of the paralysed muscles and prevent further wasting. Finally, in advanced stages, mechanical appliances may be needed to prevent or rectify contractures and deformities. If the case is seen during the acute febrile period, antipyretic measures should be adopted and counter-irritation applied over the affected region of the cord. This will be over the *cervical* enlargement if the paralysis is limited to the upper extremities, and over the *lumbar* enlargement if it is confined to the lower, or over both if both limbs are involved.

To reduce the fever and inflammation, general antipyretics should be given. In strong children a minim of tincture of aconite, with 20 grains of citrate of potash and a little syrup of lemon, in two or three teaspoonfuls of water, may be given every four hours; or aconitine in granules ($\frac{1}{450}$ grain), one every four hours. If this drug does not reduce the pyrexia in twenty-four to forty-eight hours it should be discontinued, and a half-grain or a grain of phenacetin, with a grain of hydrobromate of quinine, mixed with a little lemon-juice and water, given in its stead. In feeble children it is best to begin with the latter. A brisk aperient should be given at starting, such as a grain or two of calomel with 10 to 20 grains of compound jalap powder, and this may be repeated if the bowels become confined.

Sponging the body frequently with a mixture of eau-de-cologne or alcohol and tepid water has also an excellent effect on the fever. To the affected part of the spine an **ice-bag** may be applied for an hour at a time, and if there is an opportunity of doing this at the very outset of the disease much good may result therefrom.

The ice-bag is of less use after the disease has existed a few days; then counter-irritation, in the form of dry-cupping or stimulating liniments or strong iodine paint, should be used. These applications are better borne and more easily applied to children than blisters or sinapisms. Iodine paint can be readily applied over the seat of the disease, or a strip of flannel soaked in a liniment composed of equal parts of linimentum chloroformi and linimentum sinapis compositum is also easily applied. As it is desirable, in order to lessen spinal hyperæmia, that the child should not lie on its back, it is, perhaps, an advantage to make tho skin over the spine tender with counter-irritants. It should be encouraged to lie on its side or on its belly.

The administration of *ergot* at this period has been advocated, but it may be doubted if it has any efficacy. There is, however, no harm in giving it, and the usual dose of the fluid extract is, according to the age of the child, 10 (for a child of one year) to 25 minims every four hours. Large doses of potassium iodide, together with mercurial inunctions, have been advised, but we fail to see the indications for their use; nor does there appear to be any strong evidence of their utility. They are also very depressing measures, and ought not to be lightly prescribed.

If there is much restlessness potassium bromide may be given to soothe and quiet, and should the disease begin with convulsions, 10 to 20 grains of this salt, combined with 5 to 10 grains of chloral, should be administered, dissolved in 2 oz. of water, by enema.

But, too commonly, either the case is not seen until after the acute attack, or the acute attack is misinterpreted. When loss of power in one or more limbs, or muscular groups, has become evident, then careful and long-continued treatment is necessary, in order to maintain nutrition, restore power, and prevent deformities. Of course, if all the motor cells in the cord pertaining to a particular group of muscles are destroyed, then paralysis of that group must remain complete; but if some of the cells remain intact those muscles may regain much, if not all, their power; and, as a matter of fact, we find early and persistent treatment often rewarded by either complete or partial restoration of function in the paralysed groups.

The medicine best adapted to favour the restoration of muscular power is **strychnine,** but as it promotes spinal hyperæmia it must not be given until quite a month after the onset of the attack. Professor Starr recommends that it should be pushed "until slight twitching of the normal muscles, or at least decided increase of the spinal reflexes, is produced." He advises that it should be given for four days in the week for some months, as its intermittent use seems to stimulate the cord more than its continuous use. He adds to the strychnine $\frac{1}{40}$ grain of arsenious acid as a nerve-tonic thrice daily.

But voluntary or passive exercise and electrical stimulation of the muscles are the most important remedial agencies. "By exercise a half-paralysed muscle may be brought up to a point at which it will do an amount of work nearly equal to the normal," and the child should be trained to the use of some simple mechanical contrivance,* by which resistance may be offered to the action of the particular muscles affected, which he should regularly and voluntarily make efforts to overcome. Such exercises should be practised two or three times a day.

Nothing is more useful or more important than regular, thorough, systematic **massage** of the muscles involved, in order to stimulate the circulation in them and promote their nutrition. This may be usefully combined with frictions with warm olive oil or cod-liver oil, and the limb should be kept warm with extra clothing. Gowers says: "The muscles should be daily rubbed and kneaded and gently pinched. The rubbing should be especially upward, so as to expedite the flow of the blood in the veins."

Professor Starr's observations on the application of electricity in these cases are so sound and practical that we cannot do better than quote them :—"Electricity applied to the muscles will secure their contraction, and hence will exercise them when voluntary exercise is impossible. At the same time, applied in the form of galvanism, it promotes all those chemical changes in the parts near the poles which are essential to growth. To the muscles which respond to faradism a faradic current should be applied for ten minutes daily. Such response may be obtained in muscles which are only slightly paralysed, and these will recover spontaneously in time, but will regain their power more rapidly under faradic treatment. The muscles which are seriously affected do not, however, respond to faradism, and to these it is necessary to apply an interrupted galvanic current, faradic applications being useless. These muscles respond more vigorously when the positive pole is placed on the muscle; hence that is the pole to be used, the negative being placed on the back. The interruptions should be made by an electrode held in the hand and provided with a finger-key, and each muscle should be treated for about three minutes daily. About one hundred interruptions can be made to the minute by the finger. The strength used should be the least which will secure a contraction in the muscle. When interruptions of the current do not produce a prompt response, alternations of the current may be employed by placing either pole on the muscle and the other on the same limb about a foot away, and reversing the current by means of the pole-charger in the battery. The reversals can be made by the hand at the rate of sixty a minute." *

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* These can be constructed at home with a little ingenuity by any intelligent mechanic.

It must not be overlooked that in this disease electrical applications are unusually painful, and that children are readily frightened by them; and it is advisable, in order to gain their confidence, at first to apply the sponges and electrodes *without any current*, so as to familiarise the child with the apparatus, and afterwards to begin with exceedingly weak currents, the strength of which can be gradually increased. These applications may be made daily for two or three years, and even longer if the nutrition of the muscle is obviously improving. But if after two years all these measures appear fruitless, it will be useless to continue them. We agree with Starr that the application of the electrical current to the spinal cord is without any effect on the pathological changes present there.

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* Hare's "System of Practical Therapeutics," vol. iii. p. 269.

For the avoidance of deformities the use and application of suitable apparatus must be made the subject of careful study in each case, and it is best, when practicable, that such apparatus should be designed and constructed with the co-operation of a skilful orthopædic surgeon.

It is scarcely necessary to add that nutritious food must be supplied, and appropriate tonics, such as the mixed hypophosphites, must be given when required.

THE TREATMENT OF PARAPLEGIA AND THE MORBID CONDITIONS ASSOCIATED THEREWITH.

Paraplegia, or loss of power limited to the lower part of the body, although a symptom only, is usually associated clinically with a group of morbid conditions, which call for remedial treatment. Much obscurity often exists as to the precise pathological nature of the morbid changes in the spinal cord, upon which the paraplegia depends, and even their recognition, when possible, affords but slender indications as to the nature of the therapeutic measures which should be employed.

Paraplegia may arise as a result either (1) of changes originating within the cord itself, or (2) of lesions arising from *compression* of the cord from without.

(1) *Diffuse inflammation* of the substance of the cord, or **myelitis,** in its *acute* and *chronic* form, is by far the most frequent and important cause of paraplegia. *Myelitis* can often be traced to exposure

to cold and wet, sleeping on damp ground or in snow, or prolonged immersion, or working up to the knees in cold water. *Bodily fatigue* is another cause, or fatigue coupled with exposure, as in forced marches in cold and wet weather. It is occasionally, but very rarely, a complication of some specific infective fever, such as small-pox or typhoid. Syphilis and sexual excesses are also amongst the causes of myelitis.

Of other *intrinsic* causes of paraplegia we may enumerate *hæmorrhage* into the cord, an extremely rare occurrence, and one which may be recovered from by absorption of the clot; it is scarcely possible to diagnose it, and, except the enforcement of absolute rest, no special treatment would be needed. *Tumour within the cord* is also a cause; this may be a syphilitic *gumma*, or a *tubercular* mass, or a *glioma*. For the removal of the latter, when its situation can be localised, surgical operation is now occasionally undertaken, and, so far as *recovery* is concerned, sometimes with success and sometimes with failure. *Anæmia* of the cord, from loss of blood or from embolism, has been advanced as a rare, but occasional, cause of paraplegia; and **diver's palsy,** the form of temporary paraplegia that has been observed to occur sometimes in those engaged in diving operations, has been referred to temporary anæmia of the cord. *Hyperæmia* of the cord, although believed by some authorities to be an occasional cause of paraplegia, is doubted to be so by others. Spinal *concussion*, as in railway accidents, is sometimes the cause of paraplegia, although some physicians suggest that, in these cases, there may be a minor degree of myelitis.

The *syphilitic* cases, it should be remembered, may not necessarily depend on a gumma within the cord, but may originate in syphilitic arteritis, causing myelitis from defective blood-supply.

Much obscurity rests on so-called cases of **reflex paraplegia.** Cases have been reported in which paraplegia has disappeared on the removal of intestinal worms, on the reduction of a displaced womb, or on the relief of a tight stricture; and paraplegia occurs occasionally in connection with other affections of the urethra and bladder; whether some of these cases are *hysterical*, and whether some are due, as has been suggested, especially in the bladder cases, to "progressive ascending neuritis," we need not now consider; the important point to remember, from a therapeutic point of view, is that such cases do occur, and that some of them are cured by the simple measures mentioned. Reference to hysterical paraplegia is made in the chapter on hysteria.

(2) Of the second group of causes of paraplegia, those which act by slowly **compressing** the cord, it is important to note that their first effect is to produce *pain*, by pressure on the posterior roots of the nerves; next they excite secondary *myelitis*, with softening; and finally, they lead to complete destruction of the cord at the point of pressure. The most frequent of these causes is **spinal caries**, or Pott's disease, or angular curvature, generally due to tubercular disease of the vertebræ; *malignant disease* of the spine (carcinoma, sarcoma), primary or secondary, is also a frequent cause; some of these growths begin in the meninges. Aneurismal and hydatid tumours have been enumerated amongst these causes, but they are excessively rare.

There is a form of paraplegia which, as a *primary* affection, is extremely rare, and of uncertain causation; but, as a *secondary* affection, it very commonly follows transverse lesions of the cord; it is termed *spastic paraplegia*, from the circumstance that the paralysed limbs are rigid from *spasm* of their muscles.

A few words with regard to the principal **symptoms** of these several forms of paraplegia, and we shall then be in a condition to enter on the subject of their treatment.

In **acute myelitis**, or acute softening of the cord, the onset is often sudden, and there is some pyrexia present. The paraplegia may be complete; and should the disease extend to the cervical region, there may be more or less loss of power of the upper limbs. After a brief period of hyperæsthesia, sensation is also lost. Paralysis of the rectum and bladder leads to troubles in urination and defecation. The muscles rapidly atrophy. Acute bed-sores may form over the sacrum and on the heels. In the most severe cases the pulse becomes rapid, the tongue dry, and the temperature may reach 107° to 108°, and be accompanied by delirium, and death may supervene in a few days. In less acute forms the paraplegia may be preceded by incomplete loss of power, with pain and heaviness in the legs. The muscles do not waste so rapidly, but become at first *flabby*, and subsequently rigidity sets in. A girdle sensation is often felt between the epigastric and umbilical regions. There is the same tendency to the formation of **bed-sores**, and to vesical and rectal troubles. *Cystitis* is a troublesome and serious complication. There is at first retention and then incontinence of urine, which becomes alkaline, ammoniacal and offensive. The bowels are constipated, but there is inability to retain the fæces. There is also a **chronic** form, which is attended with sclerosis and not softening of the cord (*chronic interstitial myelitis*); it begins insidiously, and its progress is gradual, and may spread over many years. It sometimes extends upwards slowly until it invades the whole length of the cord, and gives rise to what is known as "creeping palsy."

In paraplegia due to **compression** the clinical features of the case are somewhat different; we encounter symptoms due to interference with the *roots* of the *spinal nerves* emerging at or just above the level of the disease; the chief of these is *pain referred to the parts to which the affected nerves are distributed.* There may also be extreme hyperæsthesia, with areas of anæsthesia (*anæsthesia dolorosa*). Pain in the back and tenderness over some of the vertebral spines may be present. These extrinsic symptoms are followed by those of pressure on the cord itself, the chief of which is usually a *slowly* developing loss of power in the lower extremities. The bladder symptoms are less marked than in intrinsic cases, and may not appear till late in the course of the disease.

In *primary spastic paraplegia*, which is believed to be dependent on a primary *lateral sclerosis*, the symptoms are distinctive. In the first place, the loss of power is not marked, but there is a feeling of fatigue and stiffness and a dull aching pain in the back and calves of the legs. The stiffness is particularly felt on rising in the morning. The gait is characteristic—the legs move stiffly and hesitatingly, and there is dragging of the toes. The spasm of the adductors causes the knees to touch, and sometimes produces cross-legged progression; and when extreme the legs are separated with great difficulty. The power of walking is then lost. The nutrition is maintained, and the muscles may even be hypertrophied. The reflexes are greatly increased. The slightest touch will sometimes throw the legs into violent clonic spasm. A history of syphilis is said to be often present. The course of the disease is usually very chronic, and the patient may be able to get about for years. Disorders of the bladder and rectum do not usually occur till late.

Chronic spinal meningitis is regarded by some German authorities as of frequent occurrence as a *primary* disease, giving rise, amongst other symptoms, to *paraplegia*, often incomplete and variable in degree. English and American physicians consider it exceedingly rare as a primary affection, although a common enough accompaniment of *compression* cases, as in those dependent on vertebral caries, or syphilitic gummata. We shall refer to this point again presently.

Except in the cases of myelitis and paraplegia from mechanical injury or *compression*, we have few *causal* indications to guide us in the **treatment** of these affections; nor can we pretend to be able to exercise any remedial or curative influences over the changes in the cord induced by these varieties of inflammation. In cases of acute myelitis, where the inflammation attacks the parenchyma of the cord, and leads to a rapid softening and disintegration of its cells and nerve-tubules, we are powerless; and we can only hope to act effectively when we are fortunate enough to see the case in the initial stage of active hyperæmia, before those destructive changes have taken place, an opportunity which rarely occurs.

In the various forms of chronic myelitis in which the inflammatory process affects chiefly the neuroglia, it is doubtful if we can exercise much control over the interstitial proliferation and arrest the compression and destruction of nerve-cells and nerve-tubules which must attend the sclerosing process. It follows, therefore, that our therapeutic efforts in most of these cases are directed, rather to the relief and prevention of the consequences of these pathological changes in the cord, than to the direct removal of the changes themselves; in short, our treatment is usually *palliative*—rarely *curative.*

Preventive measures can be deduced from the enumeration we have given of the causes of myelitis, so far as we know them; but, practically, when is a physician ever asked to *prevent* such attacks?

In cases of **acute myelitis** our first duty is to do what we can to diminish the intensity of the inflammatory process and the local hyperæmia attending it. The patient should be placed on a comfortable water-bed, or, if this is not obtainable, by means of small cushions or pillows the weight of the body should be taken off the bony prominence and evenly distributed. To avoid postural hyperæmia he should be induced to lie prone in bed, or on one side, and his position should be frequently changed, in order to avoid the formation of bed-sores, to which these patients are so subject.

Counter-irritation, or the application of the ice-bag over the affected portion of the cord, may prove useful. The **ice-bag,** if the patient should be seen at the commencement of the case, is a valuable application. It should be applied for an hour or two at a time and removed at short intervals, but freezing must be avoided. Leeches, wet and dry cupping, blisters, and the actual cautery have all been advocated and used locally. The objection made to blisters, on the ground of their favouring the formation of bed-sores, seems well founded, although they have such distinguished advocates as Erb and Niemeyer.

Leeches, or wet or dry cupping, can be combined with the use of the ice-bag, and should be adopted in the early stages and with fairly vigorous patients. In feeble ones we should be content with *dry* cupping, and in such cases the actual cautery may also be used. In France, especially, the actual cautery is much used in these cases, and the "*points de feu*," which can be made by Paquelin's cautery, is a very convenient, rapid, efficacious, and clean form of counter-irritation. These small-pointed cauterisations leave no sore if lightly applied, as they should be, so as to burn only the skin. They are made in parallel series on each side of the spine, and may be renewed after five or six days if necessary.

The bowels should be freely evacuated by a few grains of calomel followed by a saline, and they should be kept freely moved by daily doses of some saline aperient. These free discharges from the bowels help to relieve spinal hyperæmia, and they prevent the troublesome accumulation of hardened fæces in the paralysed large intestine.

There are three extremely important points in the treatment of all cases of this kind—viz. due attention to the state of the bladder, and to that of the rectum, and to the prevention of bed-sores. They are closely associated, for the occurrence of bed-sores is often due to a want of care and cleanliness in attending to the state of the bladder and bowels.

With regard to the bladder, we may have to deal both with retention and incontinence. To relieve the former a soft catheter, rendered thoroughly *aseptic*, must be introduced into the bladder, which should be emptied as completely as possible. There is a great tendency in these cases for the urine to decompose in the bladder, and so set up a septic pyelitis which may itself prove fatal. There are several drugs which may be given by the mouth, and which, being secreted with the urine, prevent its decomposition by their antiseptic properties. One of the best of these is salol, which may be given in 10- or 15-grain doses three times a day; or boric acid in 10-grain doses; or sodium benzoate or salicylate may be employed in the same doses. If these measures fail, we must wash out the bladder several times a day with a warm solution of borax—60 grains to the pint—or some other weak antiseptic solution. In incontinence it is easy in the male to apply an indiarubber urinal, but in the female it is very difficult to prevent bed-soiling by urine. Large sponges (frequently wrung out, and before re-application cleansed in antiseptic fluid) or absorbent cotton, covered with oil silk, may be kept applied to the genitals, which should be kept as clean as possible by frequent spongings with warm water, followed by oiling with weak carbolic oil. As the fæces when in the rectum cannot be voluntarily retained, it is advisable to wash the rectum out with a large enema of soap and water daily, so as to avoid, as far as possible, fouling of the bed by involuntary evacuations. Of course, when purgatives are being given, attention must be paid lest a fluid motion be passed in the bed; and it is for this reason that, excepting in the earliest stage, it is better to withhold active purgatives and to trust to enemata to unload the large intestine. In advanced cases, if this has been neglected, large and hard accumulations are apt to form in the rectum, which have to be mechanically removed.

The **prevention of bed-sores** is of great importance, because, when once formed, in this affection, they are healed with great difficulty, and may of themselves lead to a fatal result. The care with regard to the urinary and alvine evacuations we have insisted on is a great help in this direction. The lower part of the back should be kept frequently washed and thoroughly dried by soft towels, and, after washing, the skin should be quickly sponged with eau-de-cologne or rectified spirit, or with rectified spirit containing about 10 grains of tannin to the ounce—this is a very excellent lotion for hardening the skin and diminishing the risk of bed-sores. Any spot which looks red and tender may be protected from pressure by a soft ring-shaped pad, or a large piece of amadou plaster may be applied, with a hole in the centre. If a sore has actually formed, it should be cleansed by washing with sublimate solution, and dressed with lead or zinc ointment or carbolised vaseline. Rapid healing of these bed-sores, it is said, may be promoted by an expedient suggested by Mr. Golding Bird. A thin plate of silver, exactly the size of the sore, is placed over it, and this is connected, by means of a wire six or eight inches long, with a zinc plate applied to the skin higher up, but separated from it by a piece of wash-leather soaked in vinegar. Large sores are reported to have healed in forty-eight hours when treated in this way.*

Of medicinal agents there are few on which any great reliance can be placed. The use of *ergot of rye* was suggested on *à priori* grounds, because of its power of causing contraction of the arterioles, and in some cases in which the paraplegia has not been complete, and which may, possibly, have been due to hyperæmia, recovery has been reported to have followed its employment. Professors Starr and Hammond both recommend dram doses of the extract to be given three times a day; or ergotin or ergotinine may be given hypodermically. Dujardin-Beaumetz has been disappointed in its use, and thinks its administration is based rather on theoretical than practical grounds.† Starr commends also the use of potassium iodide in 10-grain doses three times a day, even in acute cases, and apart from anti-syphilitic considerations. It has been contended that this drug also causes contraction of the spinal vessels, and so lessens hyperæmia; but this appears to us very doubtful, and its success in certain rare cases of recovery is more likely to be due to an anti-syphilitic action, or to its eliminative or antagonising influence on some other toxic agent possibly of gouty or rheumatic origin. When there is the slightest evidence of syphilis, not only should potassium iodide be given, but free mercurial inunctions should be prescribed. In more chronic syphilitic cases the perchloride of mercury should be given, and its use is often attended with marked benefit.

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* Fagge's "Practice of Medicine,' vol. i. p. 448.

† "Clinique Thérapeutique," vol. iii. p. 305.

When the disease has become *chronic*, the question arises as to the value of electricity and thermal baths.

Electricity appears to be useless in some forms and useful in others; and as it is impossible to predict beforehand in what particular case it may prove of service, and as no harm can attend its use after the acute stage has quite passed away, it is as well to give it a chance in all chronic cases. The galvanic current should be passed along the spine by means of large sponge electrodes, one on the neck and the other on the lumbar region; they may be moved gently up and down, and the current from time to time reversed. When the situation of the disease in the cord has been distinctly localised, one pole may be placed on the seat of the lesion and the other on the corresponding level of the anterior surface of the body. Prof. Rockwell quotes instances in which remarkable improvement followed the persevering application of galvanism on alternate days to the lower part of the spine and to the legs; and he and others have noted the striking improvement in the appearance of bed-sores during this treatment. The nutrition of the wasted muscles should be promoted by massage and faradisation.

Resort to **thermal baths,** and especially to the cooler "indifferent" baths, such as Wildbad, Gastein, Ragatz, Schlangenbad, etc., or to the gaseous brine baths of Nauheim and Rehme, and to certain sulphur baths as Aix-la-Chapelle (the latter particularly in syphilitic forms), is frequently prescribed in Germany for those cases, mainly, which are believed to depend on **chronic spinal meningitis,** possibly of gouty or rheumatic nature, and originating in exposure to cold. These baths are believed to promote the absorption of inflammatory exudations, and at most of them massage and electricity are also used to promote the nutrition of the paralysed muscles. They are usually situated in agreeable localities, where a great part of the patient's time can be passed in the open air, and the hygienic conditions present, as well as the regular systematic treatment, are no doubt as well calculated as any remedial measures can be, to effect some improvement in these always protracted, and often hopeless cases.

The gentle application of hydrotherapy is also useful in the mild chronic cases of slow progress, and may be applied in the manner described in the section on tabes (page 316). Baths at a high temperature are apt to be injurious; but in old cases, with rigidity and contractions of the limbs, the best results are obtained from daily immersion in a bath of 90° F. for half an hour at a time.

Counter-irritation to the spine, in the form of the actual cautery (Paquelin's), as already described, appears to be of use occasionally in the treatment of chronic cases. There is much difference of opinion as to the propriety of giving *strychnine* in these cases. Dujardin-Beaumetz accepts the teaching of Vulpian that it is not only useless, but may be injurious in cases dependent on structural lesions of the cord, on account of its irritant action on the medulla, and that it is only useful in functional paresis; Fagge also thinks it of doubtful value; Whitla, on the other hand, considers the injection of strychnine into the substance of the muscles "of the greatest benefit"; and Prof. Starr recommends its employment in chronic diffuse myelitis when reflex excitability is not great; he gives $\frac{1}{10}$ grain four times a day for a fortnight at a time. He, however, points out that it must be avoided in transverse myelitis with much irritation of the limbs. We are not ourselves disposed to regard this drug as of any *special* value in cases of chronic myelitis; but it may be useful, in some, as a general tonic, and may be given in that sense, just as we often have to give such tonics as iron, quinine, or arsenic.

If the patient is able to sit up, he should be encouraged to do so, and to take exercise regularly in a wheeled chair. He should be warmly clothed, protected from any exposure to cold or damp, and guarded from all excitement, physical or mental.

With regard to the treatment of **compression** cases some special observations are necessary. Those dependent on aneurismal pressure, or that of a malignant growth, invading the spinal cord, are hopeless; and we can only contribute to the relief of these unfortunate patients by the free use of pain-quelling agents. The various analgesic agents described in the section on neuralgia may be tried in these cases; but, in almost all, we shall finally have to resort to the hypodermic use of morphine with or without atropine. Locally, the application of opium and chloroform or belladonna and chloroform liniments will be of value.

Should we have reason to believe that the compression is caused by a syphiloma, we must use mercury and potassium iodide freely. Hypodermic injections of *mercuric peptonate* have been used in these cases.

Cases of angular curvature from tuberculous vertebral caries are often very successfully treated by **rest** and **suspension.** Rest should be absolute, if practicable, in the recumbent and prone position. Cases have been cured by rest alone. *Suspension* also has yielded most brilliant results, and has often succeeded when other methods have failed. The chief value of suspension is, as is now generally recognised, that it allows of the application of plastic support. This method needs the greatest skill and care in its application. The method of *elastic extension* has been warmly advocated by Victor Horsley if the patient comes under treatment early. Opening the spinal canal by *laminectomy,* when there is reason to conclude that an abscess may have formed and is compressing the cord, has been followed by excellent results in some instances. For full descriptions of these surgical methods of dealing with cases of compression myelitis we must refer to special treatises.

Anti-tubercular remedies should, at the same time, be prescribed, such as cod-liver oil, the syrup of the combined hypophosphites, fresh air, preferably at the sea-side for children, and good nourishing food, containing a good supply of fat. Cases of paraplegia from vertebral caries have been reported in which remarkable improvement has been manifested while taking large doses of iodides—30-grain doses of potassium and sodium iodides every two hours—sensation and movement, which had been lost for months, having been restored to the paralysed limbs.*

Charcot commends the application of the actual cautery along both sides of the spinous processes.

In cases of **diver's paraplegia** inhalations of oxygen and compressed air have been advised, and morphine injections to relieve pain. If the paraplegia does not disappear soon, it must be treated on the principles already laid down.

In the rare cases of primary **spastic** paraplegia, dependent on lateral sclerosis, galvanism to the spine is said, on the authority of Erb, to have been attended by amelioration and sometimes cure. Treatment at the gaseous sool baths of Nauheim and Rehme has also been attended with benefit. Nitrate of silver and bromides have been recommended.

Osler states that he has seen several instances in which persistent frictions, with forcible flexion and extension, "and the application of proper apparatus, have enabled a patient to get about comfortably."

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* Fagge's "Practice of Medicine," 3rd edit., vol. i. p. 479.

Secondary spasmodic paraplegia, in which the limbs are generally flexed and not extended, is not uncommon. We have referred to the usefulness of prolonged immersion in warm baths, at 90° F., in these cases. Fagge mentions several cases in which he considered the administration of the extract of Calabar bean appeared to remove the rigidity; but on careful consideration of those instances, they seem to us to belong to the class of cases, occurring amongst the poor, in which prolonged rest in bed or in a hospital is itself a most influential curative agent.

PROGRESSIVE MUSCULAR ATROPHY. AMYOTROPHIC LATERAL SCLEROSIS. BULBAR PARALYSIS.

These related affections, dependent on slow atrophic changes in the motor tract of the spinal cord and medulla, offer little scope for therapeutic considerations. Most physicians regard them as altogether incurable and irremediable. Should there be any suspicion of a syphilitic taint, mercury and potassium iodide should, of course, be administered. It is possible, as some have taught, that improvement occasionally attends the prolonged use of arsenic and strychnine. In those cases attended with muscular spasm (spastic paraplegia) systematic *massage* appears to have been the most useful of all therapeutic measures. Some writers advocate the persevering use of the continuous current.

ADDITIONAL FORMULÆ.

For locomotor ataxy.

℞ Argenti nitratis, 7½ grains.
Extr. et pulv. glycyrr., q.s.

Dissolve the nitrate of silver in a very small quantity of distilled water, and then add the other ingredients and make into fifty pills. One night and morning. (*Bamberger.*)

For locomotor ataxy.

℞ Zinci phosphidi, 12 grains.
Pulv. glycyrrhizæ, 20 grains.
Syrupi et pulv. acaciæ, q.s.

Ut f. pil. 100. One to five daily. (*Vigier.*)

For the lightning pains of ataxy.

℞ Sodii bromidi, 2 oz.
Extr. ergotæ fluid., 1½ oz.
Aquæ camphoræ ad 4 oz.

M. f. mist. A teaspoonful every four hours. (*Hamilton.*)

In locomotor ataxy.

℞ Acidi phosphorici diluti, 6 drams.
Syrupi, 3 oz.

M. f. mist. A teaspoonful, increased to a dessertspoonful, in water thrice daily. (*Lambert.*)

For myelitis.

℞ Sodii iodidi, 30 grains.
Syrupi aurantii, 5 drams.
Aquæ ad 6 oz.

M. f. mist. To be taken daily. (*Bamberger.*)

For myelitis (early stage).

℞ Ergotini, 45 grains.
Sacchari alb., 75 grains.

M. et divide in pulv. 15. One three times a day. (*Benedikt.*)

For subacute cases.

℞ Extr. physostigmatis, 80 grs.
Pulv. et extr. glycyrrhizæ, q.s.

Ut f. pil. 90. One three times a day. (*Benedikt.*)

CHAPTER III.

THE TREATMENT OF NEURALGIAS.

Neuralgia either (1) Symptomatic or (2) Idiopathic—Etiology—Symptoms—*Treatment*—Causal Indications—Baths in Gouty and Rheumatic Cases—Potassium Iodide—Mercurial Inunction in Syphilitic Cases—Cases associated with *Anœmia*—Arsenic—Iron—Strychnine—Cod-liver Oil—Chalybeate Baths and Waters—Oxygen Inhalations—*Malarial* Cases—Quinine and Arsenic—*Neuropathic* Cases—Rest Cure and Massage—Hydrotherapy—Bromides—Valerianate of Zinc. *Pain-relieving Remedies:* Counter-irritation—Stimulating and Anodyne Embrocations—Blisters—Thermo-cautery—Sulphide of Carbon—Chloroform—Electricity—Acupuncture—Aquapuncture—Local Application of Cold—Narcotic and Analgesic Drugs: Opium, Belladonna, Aconite, Veratrine, Cannabis Indica, Menthol, Chloral, Butyl-chloral, Chloroform Injections, Gelsemium, Antipyrin, Antifebrin, Phenacetin, Exalgine, Cocaine.—Phosphorus, Ammonium Chloride, and other Drugs.
Special Forms of Neuralgia—Trigeminal Neuralgia—Iron, Quinine, etc., etc.—Surgical Measures—*Sciatica*—Opium and Sulphur—Rest Cure with Ice-bag, etc., etc.—Thermal Bath Treatment—Mechanical Treatment—*Cervico-Occipital—Cervico-brachial—Intercostal—Coccygeal—Lumbar and Plantar Neuralgias.*

ALL pain may, strictly speaking, be termed neuralgic, for *all* sensation of pain is necessarily *central*, and is determined by the conveyance to the brain, or seat of sensation, of some abnormal excitement and irritation of a sensory nerve; but the term **neuralgia** is commonly restricted to a painful affection of some peripheral nerve, dependent on some functional or organic disturbance of that nerve alone, arising either at its origin, or along its course, or at its periphery.

Neuralgias have been divided into two forms: (1) **Symptomatic** and (2) **Idiopathic.** The former are caused by some *organic* change in the nerve, and may arise from actual inflammation of the nerve-trunk or its sheath; or it may be determined by injuries or wounds involving the nerve or its branches; or it may be due to compression arising external to the nerve, as from tumours and outgrowths; or it may be caused by organic *central* lesions. In the second, or so-called *idiopathic* form there is no discoverable structural changes in the nerve, and its mode of origin and pathological nature are by no means clear. It is very often found associated with **anæmic** states, and with enfeebled and debilitated nervous systems; it is prone to occur in the female sex especially, and in the members of neuropathic families; it can often be traced to certain morbid states of the blood, as malarial infection, gout, rheumatism, diabetes, lead-poisoning, etc.; exposure to cold will act as an exciting cause in predisposed persons; but in very many instances all attempts to trace its causation are fruitless.

We have ourselves been long disposed to think that vaso-motor disturbances are frequently at the root of many cases of idiopathic neuralgia, and that it is frequently determined by an alteration in the calibre of the arterioles and capillaries, either in some part of the trunk of the nerve, or at its central connections, by which the nerve-fibres or cells suffer temporary compression from the dilated and engorged vessels. That there is, in short, a kind of circumscribed *blush* affecting the vessels of the nerve, or its centre, such as we often see on the surface of the body. The remarkable manner in which the pain often comes and goes, or increases and diminishes in intensity, supports this view; and it is especially amenable to remedies that are known to exert a control over the vaso-motor centres.

When the neuralgia is due to *neuritis* or *perineuritis*, as is often the case in sciatica, and in affections of some branches of the fifth nerve, there are much more pain and tenderness along the course of the nerve-trunk than in idiopathic neuralgia.

Neuralgias are sometimes referred to reflex irritation, as in the case of carious teeth exciting neuralgia of branches of the fifth nerve which are not directly connected with the offending tooth; but in this connection it is curious to note that, although children frequently suffer from tooth-ache and often have a number of carious teeth, they rarely have neuralgia, yet they are particularly prone to certain forms of *reflex* irritation.

The following are the chief characteristic **symptoms** of neuralgia. There is usually complaint of some uneasy sensation or tingling in the part affected before the severe attack of pain comes on; the pain is usually confined to one or more of the ramifications of a particular nerve, and is almost always unilateral; although there may be constantly some tenderness on pressure over the affected nerve, especially at particular points (*points douloureux*),* the *severe* attacks of pain come on in paroxysms, spread along the course of the nerve, increase in intensity until they are almost unbearable, last a variable time, with *remissions* and exacerbations, and then gradually subside. Singular trophic or vaso-motor changes are sometimes associated with the attacks. The corresponding area of skin may at first become pale and cold, and subsequently red and injected. In trigeminal neuralgia we may note increased secretion from the related mucous membranes and secreting glands. But one of the most curious phenomena, occasionally associated with neuralgias, is the appearance of a vesicular eruption (herpes) along the course of the affected nerves. The attacks are apt to occur periodically at regular intervals, and at about the same time of the day. This periodicity of attack is not limited to malarial cases. Movements of the parts affected, or mental excitement, will often induce an attack. Liability to such attacks of neuralgia may exist for many years, and sometimes continues through the whole of life.

The successful **treatment** of *all* forms of neuralgia will, in the first place, depend on a careful and painstaking investigation of the peculiar constitutional or other conditions under which it has arisen. The employment of mere pain-relieving remedies, while no attempt is made to fulfil causal indications, will often have the effect of doing more harm than good. It may, in some cases, be exceedingly difficult to trace out the true causal relations of the affection, and we may then have to rely chiefly on analgesic measures; but this will not often be the case, and it is generally better to attack a hypothetical cause than to wholly set aside etiological considerations.

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* Particularly where the nerve escapes from a bony canal, or perforates a fascia or approaches the surface.

We shall, therefore, consider, in the first place, how we may best fulfil the **causal** and **general indications** in the treatment of neuralgias; we shall, secondly, review the various measures that may be useful and necessary for the direct relief of the great symptom **pain**; and thirdly, we shall examine the special modifications of treatment applicable to the different anatomical varieties of the disease.

(1) It is hardly necessary to say that, if the disease is dependent upon pressure on the nerve in any part of its course, by out-growths, tumours, foreign bodies, etc., surgical treatment can alone prove efficacious, except in the cases of gouty, rheumatic, or syphilitic deposits or growths, when treatment appropriate to the constitutional state may cause the disappearance of the compressing agent, and so lead to the cure of the neuralgia.

If neuralgic attacks occur in persons who are of **rheumatic** or **gouty** diathesis, treatment must be directed, not only to the relief of the morbid state of the blood, but also to the *local* changes that are apt to exist, such as deposits about the articulations or inflammation of fibrous structures, such as the sheaths of nerves, fasciæ, etc. Local applications, as well as general remedies, are, therefore, indicated in such cases. Counter-irritation over the seat of pain by flying blisters, or iodine paint or stimulating terebinthinate liniments, is most useful. Hot baths are also of great service; and in chronic cases hot mineral water baths, of which the indifferent thermal baths have attained, perhaps, the highest reputation, such as

Buxton and Bath, in England, and Ragatz, Wildbad, and Gastein, on the Continent; or the *salt* baths, such as Droitwich and Woodhall, in England; Wiesbaden, Ischl, or Bourbonne, abroad; or, in other cases, the sulphur springs prove most useful, as Harrogate and Strathpeffer, in Britain, or Aix-les-Bains, in France, or Aix-la-Chapelle, in Germany. At most of these spas massage and electrical treatment are applied as potent auxiliaries.

In the rheumatic cases salicin or the salicylates should be tried in combination with alkalies; and in gouty cases, the value of lithium and potash salts, as well as colchicum (which occasionally acts with magical rapidity in purely gouty neuralgias), should not be overlooked.

We would call particular attention to the unwise neglect of *potassium iodide* in the treatment of these forms of neuralgia; we consider the limitation of the use of this drug to the treatment of syphilitic neuralgias alone a great error; and when we encounter, in hospital practice, a refractory case of neuralgia more particularly of the sciatic nerve, we invariably order full doses of potassium iodide, and frequently with most brilliant results. We have had cases sent into hospital for surgical operation which have been cured in a week with this drug, cases not of syphilitic, but of rheumatic, origin. We are inclined to believe that this drug acts by eliminating, through the kidneys, the morbid constituent in the blood, which is exciting, probably, a rheumatic inflammation of the sheath of the nerve, or of fibrous structures in close anatomical relation with some of its branches.

In cases where there is only a remote possibility of a syphilitic origin of the neuralgia, potassium iodide, in full and increasing doses, should be given, and mercurial oleates, or some other mercurial preparation, combined with camphor or menthol, should be rubbed in over the painful nerve.

Neuralgias dependent, as they very often are, on **anæmia**, *chlorosis*, and depressed states of general health, and defective nutrition, require vigorous tonic treatment, hygienic, dietetic, and medicinal. Free, but not fatiguing, exercise in the open air, *relaxation from work*, freedom from anxiety and mental excitement, plenty of sleep, removal, when practicable, to some sunny, yet bracing, mountain station, and a liberal diet, including a free supply of cream, butter, oil, or any agreeable form of fat, are all of remedial value. Full doses of iron are needed in many cases, and if this does not agree well, arsenic may be given instead; the sodium arseniate is, perhaps, the best preparation — $\frac{1}{16}$ of a grain, gradually increased to $\frac{1}{8}$ of a grain, may be given after meals thrice daily; or arsenic and iron may be given together, and a very effective tonic is a combination of the liquor arsenici hydrochloricus and the tinctura ferri perchloridi. In some instances, as in delicate anæmic women, who cannot digest any of the ordinary preparations of iron, resort to a chalybeate spa, such as Schwalbach, Pyrmont, or St. Moritz, is often attended by most satisfactory results; the combination, at these spas, of the warm chalybeate baths, charged with carbonic acid gas, the open-air life, the easily-digested, light, sparkling iron-waters, and the physical and mental rest, proves one of the most efficient modes of treatment of some forms of anæmic neuralgia.

Strychnine is a valuable addition to an iron tonic in these cases; it promotes appetite, and tends to restore muscular tone. Cod-liver oil is also of great value, especially when neuralgia occurs in growing girls.

Inhalations of oxygen, or of compressed air, have also been found useful in some cases.

If the neuralgia can be traced to **malarial** infection, and if it is very distinctly intermittent in its attacks, it will often be found to yield to full doses of quinine or arsenic.

The **neuropathic** or **neurotic** constitution is especially prone to suffer from neuralgic attacks, and these cases especially require treatment appropriate to the constitutional state. A "partial rest cure" is very useful in such cases. "This consists essentially in giving the patient a large amount of digestible food, with more rest than is ordinarily taken, and employing massage."* The judicious application of hydrotherapy in a special institution, together with electrical treatment and massage, may be arranged so as to combine this "partial rest cure" with these other nerve-calming and nerve-bracing influences. Dujardin-Beaumetz recommends also treatment by *bromides* in these cases. When it is not practicable to carry out the preceding modes of treatment, the bromides may be cautiously administered, but the *valerianate of zinc* will often answer better, as it does not depress the general health like the bromides. However, it must be admitted that some neurotic patients bear bromides exceedingly well, and are enabled to lead a much more active life under their influence than they otherwise would. There is certainly no reason why the sodium bromide, in 15- or 20-grain doses, should not be given at bed-time, and once during the day; but it should not be given continuously, or the habit of bromide-taking may be established.

Massage may be looked upon, in many cases, rather as a *general* than a local remedy, for *general* massage improves the tone and raises the vigour of the whole body; and it has been found to act as a curative agent in many forms of neuralgia, quite independently of local treatment. It is, however, in sciatica that the value of massage, as a means of cure, has been especially established; and we shall return to its consideration when we deal with this special form of neuralgia.

(2) The remedies at our disposal for the direct relief of the **pain** of neuralgia are embarrassingly numerous. Many are in the form of *external* or local applications over the affected nerve, and these we will consider first.

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* Prof. Wharton Sinkler, in Hare's "System of Practical Therapeutics," vol. iii. p. 367.

Counter-irritation is certainly a most valuable measure for the relief of many forms of neuralgia. This may be applied in the form of stimulating embrocations, or mustard plasters, or blisters, or the actual cautery, or the electric brush.

Stimulating liniments, applied with brisk friction over the surface, and mustard plasters are particularly suitable to the milder attacks, but they must not be expected to yield any brilliant results in the more severe and obstinate forms. Probably the rheumatic and congestive forms, arising from chill, are the most amenable to friction with stimulating liniments, the turpentine, and the turpentine and acetic acid liniments of the B.P. are excellent for this purpose. In some cases a combination of stimulant and anodyne answers well; and to this end we can prescribe a mixture of equal parts of the compound mustard liniment and opium liniment, or of compound camphor liniment and belladonna liniment.

Slight measures of this kind will often suffice to relieve mild neuralgic attacks coming on from exposure to chill.

Blisters are exceedingly useful, and their repeated application will often suffice to cure severe and protracted cases. They are probably of chief value in the neuralgias dependent on chronic neuritis or perineuritis. The ordinary emplastrum cantharidis is the best agent for this purpose; and in many cases it is sufficient, and far more agreeable to the patient, to apply *small*, and what are termed *flying*, blisters—*i.e.* blisters not bigger than a shilling or a florin, moved from spot to spot, along the course of the painful nerve. Some apply them over the "painful points," others prefer to place them over the spinal origin of the nerve. In sciatica we have obtained the best results by applying the blister, first, over the emergence of the nerve-trunk at the sciatic notch, and then following the course of the nerve and its crural branches downwards until the pain has disappeared. Dujardin-Beaumetz, in cases of sciatica, applies a very narrow blister, not more than an inch and a half in width, along the whole length of the thigh, following as nearly as possible the course of the sciatic nerve. When *flying* blisters are used, they should not be left on more than two or three hours over each spot, according to the sensitiveness and delicacy of the skin. In some individuals no vesication will be occasioned by these flying blisters; but if vesication occurs, much care should be taken in dressing the blisters. Nearly all the annoyance of blisters arises from careless dressing. The principle to be remembered is, that the dressing of a blister should be applied *firmly* and *immovably.* After pricking the vesication at the most dependent part, and allowing all the fluid to run out, a piece of lint, a little bigger than the blister, should be spread with vaseline or some simple ointment, and applied over it; upon this a somewhat larger pad of cotton-wool should be placed, and the whole *firmly secured* by *broad strips of adhesive plaster.* Too frequently the dressing is secured by a handkerchief or a bandage, which loosens and rucks up, and the blistered surface becomes irritated, and does not heal quickly. If the plan we have described is adhered to, the blister will quickly heal, and may be, before long, repeated if needful.

Capsicum, in the form of *chillie* paste, as used at Smedley's, at Matlock, proves very useful in some chronic cases.

The *actual cautery*, and especially the thermo-cautery of Paquelin, is a very efficacious remedy in many forms of chronic neuralgia. If the pain is very limited in area, it may be applied in *points* (*pointes de feu*); but if the pain is more diffused, what is termed "transcurrent cauterisation" acts best; for this purpose the Paquelin cautery is heated nearly to a white heat, and is then drawn swiftly and lightly along the course of the branches of the affected nerve.

Some employ a heated metal button or bulb, and apply it along the course of the nerve; this may be heated to any degree in the flame of a spirit-lamp, or it may be used in some cases simply at the temperature obtained by plunging it in boiling water. To avoid the pain of cauterisation, some first apply ether spray to the parts to be cauterised.

Dujardin-Beaumetz speaks warmly of the *revulsive* and remedial effect of the local application of *sulphide of carbon* in sciatica. A piece of cotton-wool, wetted with sulphide of carbon, is placed over the part to be acted upon, and covered with oil-cloth. In a few seconds severe pain is provoked; you then remove the application, and blow away the last trace of the sulphide of carbon. The skin is left intensely red, but the neuralgic pain has often completely disappeared.*

If *chloroform* be applied in a similar manner (so as to prevent its evaporation), it has a somewhat similar effect.

Electricity is one of the most efficacious of the local agents employed in the cure of obstinate chronic neuralgias. It is, to a certain extent, also a revulsive method—as, for example, the application of the faradic current to the skin. This is usually applied by brushing with a metallic brush, or stroking with a solid metallic electrode, over the painful points. These applications are very painful, but they are often very efficacious ; and the following has been advanced as an explanation of their remedial action :—"Electrisation of the sensitive nerves determines a more active flow of blood, and as neuralgias are usually accompanied by modification in the capillary circulation, it follows that the augmentation and acceleration of the flow of the blood may lead to the removal of the painful symptoms." †

Differences of opinion may sometimes be encountered as to the value and applicability of the different forms of electricity to the relief of neuralgias. Prof. Rockwell, of New York, one of the most recent writers on the subject, attempts to decide this question. The galvanic current he considers most suitable to *true* neuralgias, cases in which firm pressure over the affected nerves aggravates the pain; and the faradic current to *hysterical* cases, in which such deep pressure does not increase, but rather relieves, the pain, which is more due to areas of cutaneous hyperæsthesia than to neuralgia. "In rare cases of excessive pain, associated with anæsthesia . . . . strong and coarse (slow intermittences) currents of faradism are of positive service. Neuralgia of the scalp is sometimes of this kind, and in these cases currents that would prostrate a strong, well man are found to be painless and curative." When *local* neuralgias arise in connection with constitutional maladies, or neurasthenic and hysterical states, the *local* application of electricity is of little use, and *general* faradisation, or *central* galvanisation, is of far greater service. In commencing electrical treatment, *mild* currents should always be used. In applying the faradic current to any part of the face or head, the hand proves the most agreeable electrode and the most efficient. In symptomatic neuralgias (of disease of the brain or spinal cord, or severe lesions of nerve-trunks), and in *tic*, electricity is only palliative; and the most favourable results must be looked for in the idiopathic forms, and those associated with rheumatism, neuritis, anæmia, and neurasthenia.

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* "Clinique Thérapeutique," vol. iii. p. 109.

† Prof. Rockwell, in Hare's "System of Practical Therapeutics," vol. i. p. 173.

Prof. Rockwell considers descending as preferable to ascending currents, and he thinks the positive pole superior to the negative in generally calming effects.

Other local measures, such as **acupuncture,** have been employed, not with the idea of producing any revulsive effect, but with the possibility of relieving some tension of the nerve-sheath, or otherwise influencing locally the morbid state of the nerve. This is a method occasionally employed by surgeons, especially for the relief of sciatica. Long, stout needles are pushed deeply down to the situation of the affected nerve, the sheath of which, it is hoped, may be pierced. Several needles are thus introduced along the course of the nerve, and, after a few minutes, withdrawn.

Aquapuncture, or the deep injection of a small quantity of water into the nerve or its vicinity, has been said to be sometimes followed by relief.

The local application of **cold,** either by means of ice-bags or evaporating agents, often acts as a useful palliative in certain cases, although it can rarely be relied upon as curative. Ether spray, a jet of compressed carbonic acid or of methyl chloride can be used to produce intense cold, but it is best to stop short of freezing. The application for three or four seconds of a jet of *methyl chloride* has been advocated by Débove and Bardet for the relief of sciatica; but it is a severe measure, and should be reserved for very refractory cases.

Many remedies directed to the relief of the pain of neuralgia are applied both internally and externally, and these two modes of application it will be convenient to consider together. We shall, therefore, now pass on to the examination of the many anodyne, narcotic, and "analgesic" drugs employed in the treatment of this disease.

Opium and its derivative **morphine** are indispensable in the treatment of severe neuralgias. To relieve the excruciating, distracting pain without delay is, in some instances, a pressing necessity; and for this purpose no drug is so reliable as morphine given hypodermically, yet none of the many remedies used in the treatment of neuralgia needs more care and caution in its application.

It has been stated, and with perfect truth, that most of the cases of morphine-craving have originated in the use of that drug for the relief of neuralgia. There is also another danger which not infrequently attends the hypodermic use of morphine, and that is serious depression of the cardiac action in persons who have weak and flabby hearts. To avoid these risks, it is most important, in the first place, not to have recourse to morphine injections except in cases of very severe pain, which have resisted other remedies; or to give it, once only, for the immediate relief of the pain and until other remedies can be made to act. Another caution to be observed is to use the smallest dose possible; try $\frac{1}{8}$ or $\frac{1}{6}$ of a grain at first, and if that succeeds do not increase it. Give even a smaller dose than this if there is any weakness of the cardiac muscle (in chronic valvular disease, especially aortic disease, in small doses, morphine often steadies the cardiac action), and combine, in this and in most other cases, a small dose of sulphate of atropine with the morphine. It is best to use the hypodermic tabloids now so generally prepared, and to dissolve them in distilled water or water that has been boiled, and to see that the syringe employed is quite aseptic. Tabloids of the following strength can be obtained: Morphine $\frac{1}{12}$ grain, and atropine $\frac{1}{250}$ grain; morphine $\frac{1}{8}$ grain, and atropine $\frac{1}{200}$ grain; morphine $\frac{1}{6}$ grain, and atropine $\frac{1}{180}$. These are the most convenient strengths, as two can be used if larger doses are needed. It does not matter, as a rule, where the injection is made. In England the arm is usually selected; in France, where there is less attention to delicacy, the buttock is often selected. In some cases, however, injection over the seat of pain seems to be the more efficacious. The pain once relieved, in some cases it does not return; and we should be particularly careful not to allow any urging on the part of the patient to induce us to inject morphine as a precautionary measure. In some cases it has been found necessary, in order to satisfy the patient, to make an injection of *distilled water* only, and frequently it has been found to answer well. Whitla has suggested an ingenious method of combining the influence of acupuncture with that of the injection of morphine—a method which he has found answer better than any other in the treatment of sciatica. He uses a solution of $\frac{2}{5}$ of a grain of acetate of morphine in 20 minims of distilled water (or a syringeful). "This he injects in several places *deeply* along the course of the affected nerve, aiming at a puncture of the nerve trunk at each insertion of the needle, which should be made at right angles to the surface where the nerve lies deep."* It is desirable to use a hypodermic syringe of rather greater capacity than the ordinary one, which is only made to hold 20 minims, and it should be armed with a longer and stronger needle than usual.

Local frictions with opium liniment, combined with warmth, will relieve some of the slighter and more diffused neuralgic pains.

We have already referred to the use of *atropine* combined with morphine; it undoubtedly increases the efficiency of the latter. *Belladonna* has also been used internally for the relief of neuralgia. Formulæ for its administration will be found at the end of the chapter: the liniment is a useful external application for the milder forms, and may be applied mixed with an equal part of chloroform liniment.

Aconite and aconitine are also anti-neuralgic remedies, which are used both internally and externally. They are of chief value in trigeminal neuralgias. Duquesnil's crystalline aconitine in doses of $\frac{1}{250}$ to $\frac{1}{100}$ grain may be given until it causes slight tingling or numbness of the face and lips. The ointment of aconitine or the aconite liniment may also be rubbed in along the course of the painful nerve.

Veratrine in the form of ointment (B.P.), or better, perhaps, in solution in oleic acid (2 per cent.) rubbed in along the painful nerve will often allay the pain, at any rate for a time

Cannabis indica is an old and favourite remedy with many for facial neuralgia.

Menthol has been given *internally* in neuralgia, but of its usefulness thus administered we have no experience. Applied externally, however, it is of great service in allaying mild forms of neuralgic pain.

A liniment composed of menthol, 8 parts, chloroform, 4 parts, and olive oil, 10 parts, is a useful mode of applying it, or an ethereal solution (1 in 10) may be painted on with a brush.

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* "Dictionary of Treatment,' p. 536.

Chloral is of little use internally for the relief of neuralgia; it may, however, be usefully given to assist in procuring sleep, combined with an equal quantity of bromide of sodium, in certain obstinate cases, but it has but little influence over the *pain.* The liquid formed by rubbing together equal parts of chloral and camphor we have, however, found of great service when applied externally in cases of symptomatic neuralgia.

Croton-chloral or *butyl-chloral hydrate* is one of the most reliable remedies in the treatment of facial neuralgia. We were amongst the first to call attention to the value of this drug in these cases, and we published a series of observations which showed that, while it was singularly efficacious in relieving painful affections of the branches of the fifth nerve, it had very little effect on other forms of neuralgia.* It may be given in 3-grain doses made into pills with glycerine of tragacanth, or, preferably, in solution, 2 to 5 grains dissolved in a little glycerine (20 minims) and orange-flower water (1 ounce). This dose may be given every hour for 4 doses; if by that time it has had no effect it may be set aside as unsuitable to the case in hand.

We have already alluded incidentally to the use of *chloroform* externally for the relief of neuralgic pain; but it is rarely used alone for this purpose, being usually advantageously combined with other narcotics. Nor is it often used as an inhalation in these cases, although it would be quite justifiable to do so in extremely violent attacks of pain, in order to gain time for the employment of other remedies, or in case of their failure. It is to its use in the form of *hypodermic injections* that we wish now to refer. It has given excellent results in the hands of Bartholow, Besnier, Dujardin-Beaumetz, and others. Five to ten minims or more may be injected *deeply* over the painful points; for this purpose a long stout needle should be used, and thrust down perpendicularly as far as it will go; it is therefore in sciatica that this method is chiefly applicable.

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* *Lancet*, Jan. 31st, 1874.

Gelsemium, the yellow jasmine imported from Virginia, and its alkaloid *gelsemine*, have been largely used in the treatment of dental and facial neuralgia. The preparations of this drug have been found very uncertain in their action, and Dujardin-Beaumetz states that he has discarded its use on that account, having encountered most serious toxic symptoms after using certain preparations, while others he has found inert. Dr. Wharton Sinkler and other American writers regard it as a remedy of "distinct potency" in those forms dependent on dental caries. They, however, admit the variability in the action of its preparations, and counsel small doses, gradually increased, in order to avoid its toxic effects. "It is well to keep the patient under the influence of the drug for some days—just on the verge of the extreme dose, so that a slight dizziness or dimness of vision is felt for a time after taking a dose of the remedy."* Whitla, while admitting the efficacy of this drug in obstinate cases of dental neuralgia, has observed toxic effects from its use in full doses. He "found a patient holding on to a lamp-post in the street, unable to articulate, and suffering from ptosis and diplopia, after taking two doses of 1½ grain each of the B.P. alcoholic extract." We consider half a grain of the extract and 5 minims of the tincture are safe and suitable doses to begin with, and such small doses may be given every six hours, or more frequently, until some remedial effect is produced. When we have satisfied ourselves as to the strength of the preparation used, and the susceptibility of the patient, larger doses may be given. We have ourselves obtained the best results from a combination of butyl-chloral and tincture of gelsemium, 3 to 5 grains of the former and 5 to 10 minims of the latter given in a little glycerine and aromatic water.

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* Hare's "System of Practical Therapeutics," vol. iii. p. 397.

We must next consider the use of the so-called **antithermic analgesic** drugs, so largely used of late years in the treatment of neuralgia. The chief of these are *antipyrin*, *antifebrin*, *phenacetin*, and *exalgine.*

The pain-relieving properties of **antipyrin** have been utilised, with some effect, in the treatment of neuralgia, especially in trigeminal neuralgia. A dose of 15 grains may be given at the onset of the paroxysm, and the effect maintained by 5-grain doses every two or three hours, if necessary. As a rule, if no effect is made on the pain after the first thirty grains, it will be of little use continuing to give it. It may be given in the tabloid form or in cachets, but when it is desirable to get a rapid effect it is best given in solution. A mixture may be made containing 60 grains of antipyrin dissolved in 1½ ounce of peppermint water, to which 30 minims of spirits of chloroform should be added; 3 teaspoonfuls will contain the full dose of 15 grains, and a teaspoonful the subsequent smaller dose of 5 grains. Some French authors recommend that it should be taken in rum punch to cover its disagreeable taste. Dujardin-Beaumetz advises its administration by hypodermic injection. He dissolves 60 grains in 2 drams of water, and injects 20 minims several times a day. These injections sometimes give rise to local smarting, and it is better not to use them except in obstinate forms of sciatica, when it can be injected deeply, and then the addition of $\frac{1}{10}$ of a grain of cocaine to each injection is calculated to render it painless.

We do not recommend the employment of antifebrin, on account of its occasionally alarming effects.

Phenacetin is a safe analgesic, and may be given in 3- to 10-grain doses every hour until relief is obtained; if, however, after three or four doses, no effect is produced, it will be useless to continue it.

Exalgine is a valuable addition to our antineuralgic remedies; it has been studied especially by

Prof. Fraser, and his conclusions as to its value have been corroborated by our own observations. It is soluble in weak alcoholic solutions and less so in water, and a convenient method of giving it is to dissolve 24 grains in 2 drams of rectified spirit, and to add this to 3 ounces of a mixture of some aromatic water and syrup. One or two teaspoonfuls may be given every hour for six doses. Larger doses than this may be needed in some cases, but the effects of the larger doses should be carefully watched, as toxic symptoms have been produced by too large ones. It may be given also in 1- or 2-grain pills made up with gum and sugar, or it can be had in chocolate tabloids.

Cocaine, in strong solution, has been injected along the course of the painful nerve with success in doses of $\frac{1}{4}$ of a grain to a grain; but it is not thought a very safe remedy unless in the smaller dose.

There are still a few other drugs to be considered, which possess a certain reputation in the treatment of neuralgia, though their mode of action is not known. *Phosphorus* is the chief of these, and its anti-neuralgic effects were carefully studied some years ago by Ashburton Thompson in England, and by Hammond in America. Thompson used a solution of phosphorus in cod-liver oil, and he gave large doses, $\frac{1}{12}$ of a grain to each fluid dram, and this dose he gave every four hours. He appears to have obtained some remarkable results, but he pointed out that if it did not relieve in 3 days it was useless to go on with it; and, indeed, it would be unsafe to continue the drug in these doses. The French method of giving the drug dissolved in oil in capsules, each capsule containing 1 milligramme ($\frac{1}{66}$ grain) is a more convenient and pleasanter form for its administration, and it is a safer dose; from 3 to 10 capsules are given daily. It has proved serviceable in some cases following brain exhaustion and overwork, and Gowers relates a case of trigeminal neuralgia of thirteen months' duration that was cured after three months' treatment with phosphorus; but many physicians look upon the protracted administration of this drug with some alarm, on account of the degenerative changes it is apt to induce, and Dujardin-Beaumetz declares that he has never obtained any good result from its use. Phosphide of zinc may be used instead of phosphorus, and can be conveniently prescribed in pills containing $\frac{1}{12}$ to $\frac{1}{4}$ grain. The *valerianate of zinc* has been found useful in the same type of case as phosphorus, and we have ourselves found the pill now commonly made of 1 grain of valerianate of zinc and $\frac{1}{60}$ grain of phosphorus of much value in the treatment of hypochondriacal cases with slight neuralgic pains.

Ammonium chloride is another drug that has been much lauded for its so-called specific effect in curing certain forms of neuralgia. It is given in solution in doses of 20 to 30 grains every 4 hours. It may be tried when other remedies fail, for it is difficult to say in what cases it may or may not succeed. *Guarana*, *tonga*, *osmic acid*, *salol*, *hyoscine*, and one or two other reputed remedies, we may have to refer to in dealing presently with particular forms of neuralgia, and we shall reserve till then what we have to say on the subject of surgical methods of treatment.

Neuralgia of the fifth nerve, or trifacial neuralgia, is perhaps the most frequent form of neuralgia which is encountered in Great Britain. This is readily understood when we consider the number of branches of this nerve, the importance of its functions and relations, and its exposed situation. One or all of its branches may be affected.

The *supra-orbital* branch seems to be affected most frequently. The pain, which is most severe at the supra-orbital notch, spreads upwards and backwards as far as the parietal bone. Painful points have been found just above the notch, at one part of the upper lid, at the emergence of the nasal branch, at a spot over the parietal bone about 3 inches above the ear, and sometimes apparently one in the eye-ball.

The *infra-orbital* branch is not often affected alone, but pain in it generally accompanies pain in the other branches. Pain in the *third division*, in the inferior dental branches, is often associated with dental caries. In all these forms exposure to cold or damp may be the exciting cause.

The more severe and intractable forms of trifacial neuralgia usually come on after middle age. The pain is often agonising, and in not a few instances has driven the sufferer to commit suicide. In the form termed *tic douloureux*, convulsive twitchings of the facial muscles accompany the attacks of pain. Sometimes the pain comes on quite suddenly with great violence, and lasts only a minute or two. This form was termed by Trousseau "epileptiform." The attacks are apt to recur at very short intervals. The affection of the infra-orbital branch is often associated with migraine. It has been suggested by Dana that this disease depends on an obliterative arteritis of the nutritive vessels of the nerve, since it is apt to occur at the age when such changes begin. We have ourselves little doubt that morbid vascular conditions form the basis of this malady.

Neuritis undoubtedly exists in many instances.

A less intense and more common form in young people is doubtless frequently dependent on dental affections, and is only amenable to the dentist's intervention.

In the **treatment** of this most painful disease, the principles and observations already laid down must be borne in mind.

Cases, associated with exhausted and anæmic states, will require iron and arsenic in the intervals between the attacks, and change of climate has often succeeded when other means have failed. Large doses of the precipitated subcarbonate of iron have long enjoyed a special reputation for the cure of this disease. Quinine, in full doses, will frequently relieve the periodic forms. Slight attacks are often averted by a glass of port. The following drugs, to which we have already fully referred, all find their applications in the different cases of this disease—some patients being susceptible to the action of one and some to the action of another of them. Butyl-chloral, gelsemium, aconitine, antipyrin, sodium salicylate in rheumatic cases, cannabis indica (pushed up to the point of tolerance); a combination of cannabis indica, arsenic, and quinine; phosphorus, potassium iodide* (especially useful if there is any periosteal thickening in inferior dental neuralgia); and for *local* application, menthol, camphor-chloral, veratrine, flying blisters over the points of emergence of the nerves, the actual cautery (has been found curative applied to the painful point on the side of the tongue in neuralgia of the lingual branch), cocaine injected hypodermically, the methyl chloride spray, electricity† (*static* electricity has proved effectual after galvanism has failed; sparks are drawn from the painful region with the negative pole).

Petersen has propounded a method of promoting diffusion of pain-relieving remedies through the skin by means of galvanism. He has employed solutions of cocaine, belladonna, atropine, aconitine, chloroform, etc., and by using a solution at the positive pole the local effects of the remedy may be obtained. A 10 to 20 per cent. solution of cocaine on the anode has given relief from severe neuralgia, for from four to eleven hours, without constitutional effects. He uses an electrode made of metal, and nickel-plated, with a rubber rim; on the metal surface is placed a piece of filter-paper or linen, on this the solution is dropped, and then applied to the skin. He uses a current of 5 to 20 milliampères.‡

The frequent failure of all these remedies to relieve the terrible sufferings of the subjects of persistent trifacial neuralgia has led to the employment of many surgical expedients to this end. *Excision* of the nerve is generally attended with relief for a variable time, but the neuralgia usually returns. Nerve-stretching and simple division have also been attended with relief of pain for some months. Excision, however, is more certain, and it is well to excise as large a portion of the nerve, and as near the ganglion, as possible. Prof. William Rose, of King's College Hospital, has devised and carried out successfully, in several cases, an operation for the removal of the Gasserian ganglion in long-standing and intractable cases of neuralgia of the fifth nerve.

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* We can quite corroborate Dr. Sinkler's statement (Hare's "System of Practical Therapeutics"), that large doses of this drug often give remarkable results in these cases, quite independently of any syphilitic taint.

† Fraenkel injects cocaine at the painful spot, and then applies a strong faradic current, placing one pole at the foramen of exit, and the other half an inch distant.

‡ Hare's "System of Practical Therapeutics," vol. iii. p. 402.

Sciatica.—Perhaps the next most common and most obstinate form of neuralgia we have to treat, is that affecting the sciatic nerve. This is most frequently a form of neuritis, or perineuritis, and may be dependent on gout or rheumatism, but it is, no doubt, occasionally an idiopathic neuralgia. It may, in some rare instances, be caused by the pressure of tumours, or of a gravid uterus, or a loaded bowel, on some part of the course of the nerve, and in obscure cases such possible modes of causation should be inquired into; for if, as some have maintained, the pressure of a loaded sigmoid flexure of the colon can cause left-sided sciatica, regular, free evacuation of the bowels would be the first measure needed to bring relief. In many instances it undoubtedly arises from exposure to wet and cold, as lying when heated on damp grass, sitting on a cold stone, etc. Simple muscular over-exertion has been said to produce it.

There is usually more or less pain along the whole course of the nerve, but the most painful points are usually at the notch where it emerges and in the middle of the thigh. Numbness and tingling, and areas of anæsthesia on the back of the thigh and calf, sometimes occur; and in protracted cases the muscles of the affected limb become flabby and wasted.

Occasionally the painful attack comes on suddenly and acutely, but far more commonly the onset is gradual, and the pain is of a wearing, gnawing character.

In some instances sciatica is symptomatic of spinal disease.

The **treatment** of sciatica must be determined by the acuteness or chronicity of the affection.

Acute attacks, of a possible rheumatic origin, may yield to warm baths, or mustard plasters, and full doses of sodium salicylate; or, if of a gouty nature, to colchicum, with alkaline and saline aperients. A full dose of Dover's powder (12 or 15 grains), in a diaphoretic draught at night, is a very useful remedy in the acute rheumatic forms. In chronic cases, when first seen, we should always try the effect, for a few days, of full doses of potassium iodide; this remedy, even in non-syphilitic cases, will often be found to give complete relief in forty-eight hours. If it fails to have any remedial effects, after three or four days, it may be set aside as unsuitable.

Rest in bed is the greatest auxiliary to all our other treatments. We have already pointed out how valuable counter-irritation is in these cases. Dry cups over the course of the nerve are also useful. Hypodermic injections, in the manner already described, of morphine and atropine (when the pain is intense), of cocaine ($\frac{1}{8}$ or $\frac{1}{4}$ of a grain), of antipyrin, of simple water, and of the other agents previously referred to, may all, in turns, be tried in obstinate cases. Whitla refers to the use of hypodermic injections of *osmic acid* in sciatica, and states that he has employed it in very many obstinate cases with success; and he mentions that Billroth has found it cure cases which had resisted all treatment for years. Fifteen minims of a 1 per cent. solution are mixed with enough distilled water to fill a large hypodermic syringe, and this is injected deeply into the nerve in six to twelve places between the ilium and the heel, introducing 1 to 2 minims at each insertion. This, it is obvious, is the method of acupuncture *plus* a little osmic acid.

We have already referred to the use of the thermo-cautery and to electricity. Massage, together with galvanism and prolonged and systematic movements of the leg, by which the nerve may be stretched without operation, has been found of the greatest use in very chronic cases. It may be needful to continue this treatment for many months to ensure a cure.

The external application of *sulphur*, recently so strongly recommended by some American writers, is the revival of an old remedy. The whole leg is enveloped in powdered sulphur, which is kept in contact with the skin during the night by a flannel bandage. One or two such applications have been reported as curing severe sciaticas.

Treatment of sciatica by *absolute rest* in bed has been warmly advocated by Weir Mitchell. The patient is not allowed to get out of bed for any purpose whatever. He is fitted with a long splint, padded and fixed by bandages, stretching from the axilla to the heel. It is made with a joint at the knee, so that the leg may be slightly flexed, and the angle is changed at each renewal of the dressings. After a few days, passive movements, to avoid stiffness, are made at the daily change of splint. The ankle is supported with a small pillow or pad, in order that the weight of the leg shall not fall on the heel. In chronic cases dry cold is also applied by means of Chapman's ice-bags along the course of the nerve, and kept on day and night for many days. If, after two or three weeks of this treatment, a cure is not effected, Paquelin's cautery is applied along the course of the nerve, and, after the healing of the blisters, gentle massage is used. "The massage should be applied with great care, lightly rubbing the surface and stroking the limb in a downward direction."

Many chronic forms of sciatica, especially when of gouty or rheumatic origin, obtain benefit from treatment at **thermal spas** at home or abroad. In all of these, nowadays, some kind of massage forms an indispensable part of the treatment. Bath, Buxton, Droitwich, Harrogate, are especially frequented in England; and Aix-les-Bains, Ragatz, Wildbad, Wiesbaden, on the Continent.

Dr. Benjamin Lee,* in referring to the application of massage for the cure of sciatica, observes: "It is in sciatica, of all the neuralgias, that massage has won its greatest reputation. Truly astonishing results have been obtained, even when the affection has been of many years' standing, and after every other conceivable means of relief has proved unsuccessful. In sciaticas of a rheumatic character induced by cold, the task, as a rule, is an extremely easy one. Strong stroking, alternated with percussion, along the course of the affected nerve, is usually all that is needed to cure the disease in a comparatively short time." In the chronic and intractable forms the application of the method recommended and practised by Dr. Schreiber at Aussee, of long continuance of passive movements, then active movements and finally massage, has been attended by some brilliant results.

We must next refer briefly to the treatment of certain other forms of neuralgia. *Cervico-occipital* neuralgia affecting the posterior branches of the upper cervical nerves and the branches of the great occipital (there is usually a *painful point* midway between the first cervical vertebra and the mastoid process), is best treated by the application of dry heat or Paquelin's cautery; internally antipyrin or phenacetin will usually relieve the suffering, and in periodic cases quinine or arsenic should be given.

Cervico-brachial neuralgia involves the sensory nerves of the brachial plexus. The pain is referred chiefly to the shoulder and along the course of the ulnar nerve. Painful points are likely to be found where the circumflex nerve pierces the deltoid and over the ulnar nerve at the elbow. It is sometimes associated with rheumatism of the deltoid. Sponging or affusion with hot salt and water twice daily, enveloping in cotton wool, and keeping the arm absolutely at rest will prove curative. When more chronic, massage and hot douches are most serviceable. Galvanism, the faradic brush, or static electricity may prove advantageous in obstinate cases. In distinctly rheumatic forms sodium salicylate or salicin should be employed ; or potassium iodide and colchicum will often be found more efficacious in gouty constitutions. When the general health is at fault, quinine, iron, and cod-liver oil may be needed. Treatment at a thermal spa frequently proves rapidly beneficial in this form.

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* Article on "Swedish Movements and Massage," in Hare's "System of Practical Therapeutics."

Intercostal neuralgia is of rather frequent occurrence, especially in anæmic and hysterical women. *Herpes zoster* or *shingles* often accompanies or precedes intercostal neuralgia. This form is no doubt commonly a neuritis. The pain attending the herpetic eruption may be allayed by painting it over with a solution of cocaine or applying a cocaine or morphine ointment, or sometimes a lead lotion allays best the cutaneous irritation. Antipyrin or phenacetin may be given internally. If the affection becomes chronic, counter-irritation over the points of exit of the corresponding spinal nerves (either a blister or iodine paint) should be applied. Hydrotherapy, and especially the use of alternate hot and cold jets, may be tried, and often with advantage. In anæmic cases, the warm chalybeate baths, and the internal use of the iron waters at Schwalbach, Spa, or some similar spring are indicated. In rheumatic cases salicin and the salicylates, or potassium iodide may be given.

Coccygodynia often proves a very intractable form of neuralgia, and removal of the coccyx has occasionally been resorted to for its relief. Dr. Wharton Sinkler mentions a severe case which was cured by always sitting on a chair which had a large hole in the seat.

Lumbar, or *lumbo-abdominal* neuralgia, differs from lumbago in radiating in various directions and not causing so much pain in movement. Frictions with stimulating and sedative liniments, such as the aconite and chloroform liniments mixed, belladonna liniment, (or hypodermic injection of atropine), sodium salicylate in full doses or actea in rheumatic forms, and antipyrin have all been used with advantage.

Plantar neuralgias, painful affections of the sole of the foot, are usually most intractable and difficult to treat. Sometimes the avoidance of any pressure on the foot and going barefooted will give relief; on the other hand, we have seen instances in which firmly bandaging the instep and front of the foot was of immediate benefit. Oleate of morphine and atropine have been applied to relieve the cutaneous sensitiveness. Dujardin-Beaumetz has found sulphur foot-baths and the application of a strong tincture of iodine useful. We have injected full doses of atropine into the dorsum of the foot with advantage.

To discuss all the remedies that have been advocated for the treatment of all the various forms of neuralgia would be an endless task; we have endeavoured in the general remarks at the beginning of this chapter, and in the special references at the end, to give as full an account as practicable of the most useful measures to employ, and we shall add in the additional formulæ some other useful details for reference.

ADDITIONAL FORMULÆ.

Hypodermic injection of antipyrin for neuralgia.

℞ Antipyrin, 75 grains.
Aquæ destill., 2½ drams.

M. f. injectio. A syringeful to be injected several times a day. (*Dujardin-Beaumetz.*)

For dental neuralgia.

℞ Tincturæ opii, ½ dram.
Chloroformi, ½ dram.
Creasoti puri, ½ dram.
Tinct. benzoini comp., 1 dr.

M. f. tinct. To be applied to the cavity of the tooth on cotton wool. (*Redier.*)

For trigeminal neuralgia.

℞ Veratrinæ, 4 parts.
Alcohol, 6 parts.
Adipis benzoat., 96 parts.

M. f. ung. "Veratrine ointment." (*Bartholow.*)

For sciatica.

℞ Extracti belladonnæ, 4 gr.
Extracti stramonii, 5 gr.
Extracti cannabis indic., 6 gr.
Extracti aconiti, 8 gr.
Extracti opii, 12 gr.
Extracti hyoscyami, 16 gr.
Extracti conii, 24 gr.
Pulv. extr. glycyrrhizæ, q.s.

Ut f. pil. 24. Two to five pills daily. (*Brown-Sequard.*)

Also,

℞ Tinct. rad. aconiti, 2 drams.
Tinct. sem. colchici, 2 drams.
Tinct. belladonnæ, 2 drams.

M. f. tinct. Six drops every six hours until relieved. (*Metcalf.*)

For trigeminal neuralgia.

℞ Butyl-chloral hydrate, 60 gr.
Extr. cannabis indic., 1½ gr.

M. et divide in pil. 12. One every three hours. (*Whitla.*)

For sciatica.

℞ Spirit. terebinthinæ, ½ oz.
Mellis pur., 1½ oz.

M. f. confectio. A teaspoonful night and morning. (*Bamberger.*)

For trigeminal neuralgia.

℞ Liq. arsenicalis, ½ oz.
Aquæ destill., ½ oz.

M. Five drops three times a day. (*Prof. Albert.*)

In periodical forms.

℞ Quininæ sulph., 30 grains.
Sacchari albi, 30 grains.

M. et div. in pulv. 6. One or two to be taken before the expected attack. (*Bamberger.*)

Also,

℞ Gummi asafœtidæ, 75 gr.
Extracti rhei, 30 gr.
Extracti taraxaci, q.s.

Ut f. pil. 60. (To be silvered.) Two pills night and morning. (*Bamberger.*)

For trigeminal and other forms of neuralgia.

℞ Sodii salicylatis, 3 drams.
Sodii iodidi, 1 dram.
Syrupi simp., 1 oz.
Aquæ, ad 8 oz.

M. f. mist. A tablespoonful thrice daily. (*Prof. Benedikt.*)

In supra-orbital neuralgia.

℞ Quininæ sulph., 5 grains.
Morphinæ hydrochlor., ⅛ gr.
Ammonii chloridi, 15 gr.

M. f. pulv. A powder, wrapped up in moistened wafer paper, to be taken every six hours, after food. (*Whitla.*)

For facial neuralgia.

℞ Butyl-chloral, 15 grains.
Glycerine, 1 oz.
Syrupi simp., 6 drams.
Spir. menthæ pip., 3 drops.
Aquæ ad 4 oz.

M. f. mist. A tablespoonful every two hours. (*Worms.*)

Hypodermic injection of ergotin for facial neuralgia.

℞ Ergotini, ½ dram.
Aquæ laurocerasi, 2½ drams.
Glycerini, 2½ drams.

M. f. injectio. Twenty minims for a dose. (*Marino.*)

For hysterical neuralgias, especially of the face.

℞ Extr. gelsemii, 5 grains.
Quininæ valerianatis, 30 gr.
Zinci valerianatis, 30 grains.
Ferri valerianatis, 30 grains.

M. et divide in pil. 20. One thrice daily, after food. (*Whitla.*)

For sciatica and crural neuralgia.

℞ Veratrinæ, 20 grains.
Vaselini, 1 oz.

M. f. ung. To be rubbed in every other day.

(*Prof. Albert.*)

For intercostal neuralgia.

℞ Chloroformi, 6 drams.
Ol. olivæ, 6 drams.

M. f. linim. For external application. (*Bamberger.*)

Also,

℞ Veratrinæ, 3 grains.
Morphinæ hydrochlor., 3 gr.
"Cold cream," 2½ drams.

M. f. ung. A piece the size of a pea to be rubbed in over the painful nerve.

(*Bamberger.*)

For visceral neuralgias.

℞ Dimethyloxychinolin (antipyrin), 2 drams.
Extr. cocæ liquid., 2 oz.
Codeiæ, 6 grains.
Glycerinæ et aquæ ad 4 oz.

M. f. mist. A teaspoonful in a wineglassful of water, four times a day, after food.

(*Whitla.*)

Also,

℞ Extracti belladonnæ vir., 4 grains.
Ferri arseniatis, 1 grain.
Codeiæ, 2 grains.
Acetanilide, 42 grains.

M. et divide in pil. 12. One thrice daily, after food.

(*Whitla.*

CHAPTER IV.

THE TREATMENT OF NEURITIS, LOCALISED AND MULTIPLE; OF MIGRAINE AND OTHER HEADACHES; OF INSOMNIA.

Localised Neuritis — Causes — Symptoms — *Facial Paralysis*—Its Treatment — *Oculo-motor Paralysis* — Operation in Sciatic Neuritis — Summary of Treatment — Multiple Neuritis — Etiology—Usually Toxic—Alcohol the most common Cause—Symptoms—Treatment.

Migraine and other Headaches — *Migraine* or *Hemicrania* — Paroxysmal Character — Premonitory Symptoms — Visual Disturbances — Course of the Attacks — Treatment — In the Intervals — In the Paroxysms — *Anæmic Headache* — Its Characters — Its Treatment—*Neurasthenic Headache*—*Congestive Headache*—Indications for Treatment.

Insomnia — Its Causes — Physical and Mental — Treatment of Different Forms—Various Hypnotic Agents.

Additional Formulæ.

NEURITIS.

We have already alluded, in the last chapter, to the fact that certain forms of neuralgia are due to neuritis, or perineuritis, especially neuralgia of the sciatic nerve. We must now consider the subject of **neuritis** in a more general and wider sense,—as a disease appearing in a variety of forms, and giving rise to a series of important symptoms, the nature and origin of which it is important to recognise, in order that we may be enabled to minister effectually to their relief.

For our present purpose it will be sufficient to consider this subject under *two* divisions—(1) *localised neuritis*, or neuritis affecting any nerve, or part of a nerve, or group of nerves; and (2) *multiple neuritis*, in which affection many, or nearly all the nerves in the body, may be at the same time affected. Either form may be acute, sub-acute, or chronic, and the symptomatic phenomena, and doubtless also the underlying physical changes, may assume very various degrees of intensity.

First with regard to **localised neuritis.** The most frequent causes of this affection are—(*a*) exposure to cold; (*b*) local injury from wounds, pressure, etc.; (*c*) the extension of inflammation from adjacent parts.

The characteristic *symptoms* of the acute or subacute forms are—pain of an aching, burning, or boring nature along the course of the nerve affected and its branches; great sensitiveness and tenderness on pressure over the nerve-trunk and its terminations; perverted sensation in the area of its distribution, such as burning, pricking, tingling, numbness, etc. Sometimes a more diffused sensitiveness and exquisite tenderness may be observed over a wide area of the cutaneous surface. Increased perspiration, effusion into joints, physical changes in the skin and subcutaneous tissues (redness, swelling, œdema, "glossy skin," herpes, and other eruptions), and occasionally local spasmodic phenomena, may occur. In chronic cases, when more or less degeneration of the nerves affected has taken place, we may encounter, as well as diminution or loss of sensation, a loss of motor power, in proportion to the extent of involvement of motor nerves. Muscular atrophy is common.

The clinical features of each case will necessarily depend on the localisation and intensity of the neuritis. If limited to the peripheral terminations of a nerve the symptoms may be mild; but if the affection diffuses itself through a whole limb or limbs, or extends to nerves, like the vagus, of vital importance, the case may assume the most grave and serious aspect.

Facial, *oculo-motor*, and other local paralyses are usually, at their commencement, instances of neuritis.

Facial or Bell's *paralysis* is usually a rheumatic neuritis from exposure to chill, or it may be due to local injury or to syphilis. If of rheumatic origin, a leech or two should be applied over the seat of emergence of the nerve; or a blister is preferred by some, and salicin, or sodium salicylate, or potassium bicarbonate should be given internally. A dose or two of calomel may also be given at first, followed by a saline aperient. Rest and confinement to a warm apartment should be enjoined. As soon as the acute symptoms have subsided, small or moderate doses of potassium iodide are appropriate. Later on electricity should be applied, and such tonics given as strychnine, quinine, and iron. Strychnine has been injected locally over the site of the nerve with advantage. If there is reason to believe the affection to depend on syphilis (in that case the auditory nerve is likely to be also involved), large doses of potassium iodide and free mercurial inunction, or hypodermic injections of corrosive sublimate, should be employed.

Oculo-motor (third nerve) paralysis is usually due to syphilis, especially when it is total. If only the external branches are involved, there is more chance of its being rheumatic. The preceding therapeutic directions apply to this and to other forms of peripheral paralysis.

Brachial neuritis of a very severe form, arising in connection with diabetes, has been found to yield to large doses of sodium salicylate, the hypodermic injection of morphine and atropine twice daily, and complete rest.*

We have already referred to the fact that most cases of *sciatica* are of the nature of a neuritis. Hence, as we have pointed out, the value of rest, of the local application of cold and of anodyne remedies during the acute stage, and of potassium iodide, massage, and electricity in the chronic stage. In the latter stage Deaver and Mills have called attention to the value of **operation.** "By opening the sheath and breaking up any adhesions that may be present" the nerve is given a better chance of repair; "or, when degenerated, by disturbing the molecular condition of the nerve and stimulating it to take on regenerative action; or, again, in those cases of chronic inflammation of a nerve in which physiological movements never allow it to be sufficiently long at rest to accomplish a cure, by removing a section of the inflamed nerve and thus getting rid of the constant irritation," * a cure may be effected.

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* Professor C. K. Mills: Hare's "System of Practical Therapeutics," vol. iii. p. 328.

We may thus summarise the general **treatment** appropriate to these cases, according to the stage of the disease, noting at the same time that the treatment suitable to the acute and sub-acute stages might prove injurious in the chronic stage, and *vice versâ.* In the *acute* stage, complete rest, with leeches, cupping, mercurials, salicylates; in the *sub-acute* stage, rest, gentle massage, sodium salicylate, phenacetin, quinine; in the *chronic* stage, electricity, strong galvanic or faradic currents, massage, Swedish movements, suitable gymnastics, mineral baths.

Secondly, as to **multiple neuritis.** This is a form of neuritis which is usually excited by toxic or infective agents. It is said, in its *acute* form, to follow exposure to cold or over-exertion, or to occur spontaneously; but it is possible, in such instances, that some other determining factor may have been overlooked. The abuse of *alcohol* is one of the most common causes, and the alcoholic form is the one we shall most frequently encounter clinically. Of the many other poisons that may cause multiple neuritis the following may be enumerated:—Lead, arsenic, ergot, carbonic oxide; the toxic substances that accumulate in the tissues in jaundice, uræmia, rheumatism, gout, diabetes; and the infections of diphtheria, scarlet fever, variola, typhoid, influenza, tuberculosis, syphilis, and other infective maladies.

The *symptoms* of this widely spread inflammation of the nerves are most various and complex, and not infrequently vague and indefinite. It is the exception rather than the rule to encounter the definite and decided symptoms described in text-books. As Prof. Starr † observes: "Numerous cases of indefinite nervous symptoms, pain of various kinds, formications and odd sensations, grouped under the indefinite terms; numbness, flushes of cold and heat, accompanied by actual changes in the temperature of the part, or only by apparent vascular irregularities; slight spasms or tremors; functional weakness with sense of fatigue, not reaching the grade of paresis, and many equally obscure manifestations of disturbed function in various parts of the body, receive their best explanation in the theory of multiple neuritis." Some cases are exceedingly acute and severe (*acute febrile polyneuritis*); they commence with rigors and fever (temperature, 103° to 104°), and the general symptoms of an acute infection. The more characteristic phenomena are intense pain in the nerves —not, however, constant—tingling and formication in fingers and toes; loss of muscular power, beginning in legs or arms and extending to the trunk (*ascending* paralysis); rapid wasting of muscles. In some cases the sensory disturbances are slight. The course is sometimes rapid, and the patient may die, within a week or ten days, from paralysis of the respiratory muscles, or from cardiac asthenia. In less severe cases, after a few weeks of a stationary condition, gradual improvement sets in, and after, perhaps, a year or more of partial paralysis, contractures, etc., complete recovery ensues.

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* *Journal of Nervous and Mental Diseases*, Dec., 1890.

† The Middleton-Goldsmith Lectures, *Medical News*, Jan. 7, 18 7.

The **alcoholic** form is the most common. It occurs especially in women addicted to the secret, constant habit of spirit drinking. The onset is usually gradual and the nature of the case often obscure; the pains and tingling of the feet and hands and tenderness of the muscles are often referred to rheumatism and neuralgia. The various degrees of loss of power usually begin in the feet and legs and extend to the hands and arms. The degree and extent of the muscular paralysis is very variable. The disturbances of sensation are also very variable in their degree, from mere numbness and tingling to severe burning and boring pains, great tenderness over the nerve-trunks, and soreness of the muscles when grasped. The hands and feet, when dependent, usually become congested and puffy. The deep reflexes are lost.

Mental symptoms, hallucinations, and delirium are not infrequent in severe forms.

The prognosis is, as a rule, favourable; and, under suitable and protracted treatment, the muscles regain their power, and recovery is established.

The disease known as **beri-beri** is an endemic neuritis peculiar to certain parts of India, China, and Japan.

The **treatment** appropriate to these cases must vary according to their acuteness and severity. The *relief of pain*, which is often very severe in the acute forms, is the first indication. Absolute rest in a *comfortable* bed is essential. Bleeding has been suggested in certain "sthenic" cases, but this will be very rarely justifiable. In alcoholic cases, the alcohol should be wholly suppressed, and a nourishing, light diet of milk, eggs, soups, light puddings, fish, pounded chicken, etc., should be prescribed. Protracted warm baths are usually particularly soothing and grateful to the patient. Some recommend* "rapidly alternating applications" to the limbs of very hot and very cold water. "A large sponge or soft towel is dipped first in very hot, and another in very cold, water, and one is made to follow the other rapidly up and down the limb. If used properly, this makes an agreeable and useful method of local sedation or counter-irritation." Opium, in some form, must also be given to relieve the pain; the best is morphine ($\frac{1}{6}$ grain) and atropine ($\frac{1}{120}$ grain) in hypodermic injections twice or thrice daily. General debility or cardiac asthenia may call for cinchona, quinine, strychnine, or digitalis.

Salicin and sodium salicylate are given largely in these cases by certain practitioners, and they certainly relieve the pain in many; but we have observed that their continued use, in quickly repeated and large doses, not infrequently produces the most serious conditions of cardiac debility. C. K. Mills recommends strongly the *oil of gaultheria*, but he admits it is apt to cause gastric disturbance. He gives 10- to 15-minim doses, and it may conveniently be mixed with one or two tablespoonfuls of almond emulsion. The bromides and antipyrin may be needful in cases with cerebral excitement. *Syphilitic* cases should be treated with mercurial inunction and potassium or sodium iodide. A combination of the latter with sodium bromide has been found useful. Malarial cases require full doses of quinine and arsenic. Lead cases require the alkaline iodides as eliminants. Arsenic is a useful tonic in chronic cases, and hypodermic injections of strychnine have been found valuable. Warm baths are of great value in most cases. *Massage*, at first of the gentlest kind, may be commenced as soon as the pains and tenderness have, to a great extent, subsided. In sub-acute and chronic cases massage, associated with galvanism, is of the greatest service. Inunctions, anodyne or remedial, may be combined with massage, such as weak aconitine ointment, mixed mercurial and belladonna ointments, or other suitable external applications. Swedish movements may, as the case progresses towards recovery, be added to massage. Electricity should be applied tentatively at first, and very weak currents used, and it should be discontinued for a time if the patient seems to be made worse by it.

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* Prof. C. K. Mills: Hare's "System of Practical Therapeutics," vol. iii. p. 333.

THE TREATMENT OF MIGRAINE AND OTHER HEADACHES.

Discomfort about the head, or **headache**, of greater or less intensity, occurs in the course of all acute febrile diseases and in most diseases attended with blood contamination. Pain in the head also occurs, of necessity, in certain diseases of the bones of the skull or its coverings, and also in certain diseases within the cranium, as inflammation of the brain and its membranes, tumour, abscess, etc. But headache, as a necessary symptom of diseases such as these, forms part of the clinical characters of these affections themselves, and does not concern us now. It is needful, however, to point out that the existence of severe and *persistent* headache should always suggest the possible presence of serious intracranial disease, or disease of the cranial bones or coverings, and especially such as may be of a syphilitic nature. It is extremely important not to overlook cerebral syphilis as a possible cause of headache, as the adequate application of specific anti-syphilitic treatment will often rapidly dissipate symptoms of the most serious aspect. The co-existence, however, of a localised paralysis will often disclose the syphilitic nature of severe and persistent headache.

But the headaches we are now about to consider are independent of the existence of acute or structural disease, and are of temporary duration. We shall begin by considering the most characteristic of these —viz. *migraine* headaches—and afterwards pass on to examine the mode of origin and treatment of the other most common forms of this troublesome affection.

Megrim, **migriane**, or *hemicrania* is distinctly paroxysmal in its character. The attacks frequently recur at intervals of about three weeks or a month ; but they may occur more frequently, even once or twice a week. Indiscretion in diet, overwork or worry, long railway journeys, or other disturbance or exhaustion of the system, will often determine the occurrence of an attack. Some warning of the attack is occasionally felt, for a day or two before, in the shape of general depression, and slight headache on getting up in the morning ; or some dyspeptic symptoms may occur. In one of our own patients the attack is always ushered in by the passage of urine loaded with phosphates, and as the attack passes off the phosphates disappear and the urine throws down lithates abundantly. The disappearance of the phosphates and the appearance of lithates in the urine is always a sign that the attack is passing off. Some patients feel cold and chilly before an attack. But the *disturbances* *of* **vision** with which the attacks not infrequently commence are most remarkable. Bright spots of light, luminous zigzags or "fortifications," luminous scintillating circles, like "wheels of fireworks," and various other appearances, are described by different patients. Seeing only the half of things, hemiopia or hemianopsia, is not very uncommon, but more frequently there is merely a blurring of objects, the outlines of which appear indistinct. Curious visual hallucinations occasionally occur, and images of persons or animals are distinctly seen.

Severe pain, usually confined to *one-half* the head, follows these visual disturbances. We have seen cases in which the ocular symptoms have alone occurred, followed simply by a slight feeling of fulness in the head. The face, pale at first, subsequently becomes flushed, and there is generally a complaint of nausea. In some instances the face remains pale. Light and noise are especially intolerable, and the patients naturally seek repose and quiet in a darkened room. Tingling and pricking are sometimes noticed in the fingers or hand and arm, and we have seen patients in whom the attack has commenced with tingling and pricking in the lips and tongue. Numbness of the right arm and leg, with temporary aphasia, has been observed to precede some attacks. These disturbances of sensation do not, as a rule, last more than fifteen to twenty minutes. Curious coincident mental conditions have also been described.*

The pain in the head that succeeds these early symptoms is often excessively severe, and the nausea we have already referred to ends in vomiting; hence the term "sick-headache." In some cases the vomiting is very distressing and aggravates the headache, but in many, after the vomiting, the headache begins to abate, the patient breaks into a perspiration, falls asleep, and awakes well. As a rule, the attack does not last more than twenty-four hours, and after a night's rest it passes away; but the severe forms sometimes last for two or three days.

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* Sinkler: Hare's "System of Practical Therapeutics," vol. ii. p. 378.

It is customary to say that the patients feel unusually well after an attack, but that is by no means always the case, and we have had occasion to observe much nervous shock, in neurotic subjects, after an attack, and particularly in those attacks in which there has been little or no headache, but only the sensory disturbances described.

This disease is frequently hereditary, and is observed especially in the gouty.

The analogy this disease bears to epilepsy can hardly be overlooked, and there can be little doubt that there is some pathological relation between them.

We may offer to the sufferers from this disease the consolation that it often disappears after middle age.

The **treatment** *of this affection* must depend greatly on the constitution and habits of the sufferer; that suitable to a robust gouty patient will not be altogether appropriate to an anæmic and neurotic subject. We will consider *first* the treatment in the intervals, and, *secondly*, the treatment of the paroxysms.

(1) Careful attention to diet and regimen is essential in all cases; but we must not expect too much from this, as many sufferers from migraine are amongst the most abstemious. The gouty subject should avoid all dietetic excesses, and should take merely a sufficiency of the plainest and most digestible forms of food. He should avoid all malt liquors, sweet wines, or, indeed, wines of any kind; and if a stimulant seems needful, a very little sound brandy or whisky, with seltzer or Apollinaris water, should be taken. Regular exercise in the open air is advisable, and all overwork or worry should, if possible, be avoided. Frequent aperients are of great service, as such patients often learn for themselves, promoting as they do the elimination of peccant substances upon which the attacks may depend. A pill of aloes and henbane, containing also a grain of blue-pill, at bed-time, and a

dose of Carlsbad or Homburg salts in a tumblerful of hot water the following morning, are one of the best *preventives* of these attacks in the gouty. The habitual use of lithia water has also been found useful in these cases.

Anæmic and neurotic patients will require a nourishing but simple diet, and will be benefited by iron tonics; but they usually require the mildest preparations of iron, such as the ammonio-citrate, which should be combined with an alkali and aromatic spirits of ammonia. The arseniate of iron, in pills of $\frac{1}{24}$ grain, after food, three times a day, we have also found useful. A course of iron waters at St. Moritz, Schwalbach, Pyrmont, or Spa often proves of great service in these cases. Bamberger gives quinine, in some of these cases, during the intervals, and a full dose of 4 or 5 grains on the onset of the attack. The advantages of regular aperients are almost as evident in these as in the gouty cases, and should never be neglected. A course of *rest treatment* has been warmly commended in these anæmic cases by some American physicians. A careful use of the bromides has proved, in our hands, very useful in warding off attacks, especially in those cases in which the sensory disturbances are chiefly complained of, and the subsequent headache is but slight. When the period of the return of an attack is well known, it is a good plan to begin giving the mixed bromides, in moderate doses, for three or four days before the attack is expected, and they will often be found to have the effect of greatly modifying its severity. The bromide of lithium and the bromide of nickel are preferred by some. We have found a combination of butyl-chloral (5 to 7 grains) and potassium bromide (10 to 20 grains) of remarkable efficacy in preventing the ocular disturbances and diminishing the intensity of the headaches in certain patients.

Many physicians are disposed to refer attacks of migraine to errors of refraction, which may be cured by *spectacles*, and glasses are no doubt of great service in some instances, and it is a good rule always to have a special examination of the eyes made for visual defects. For the same reason, cannabis indica, belladonna, and hyoscyamus have been advocated because of the sedative influence they exert on the third nerve and the muscles it supplies, including the iris. Cannabis indica, which has been so greatly praised by many, we have not found, in our own experience, a very reliable drug. It is given alone, in doses of $\frac{1}{6}$ of a grain of the extract, cautiously increased; or in combination with arsenic and iron, or, in hyperæmic states, with ergot and nux vomica. It is usually given continuously for many months.

(2) *For the attacks* we have found large doses of the bromides of great service, and especially the combination of butyl-chloral and bromide already mentioned. The latter is of particular service in markedly neurotic subjects. *Antipyrin* and *phenacetin* are also of much efficacy in affording relief in the slighter attacks, and, if given early, in allaying the distress of the severe forms. We object altogether to the use of acetanilide on account of the toxic effects it occasionally produces; nor do we approve of those large doses of antipyrin prescribed and taken by many. We are satisfied that considerable impairment of cardiac tone follows the free use of those drugs. Phenacetin we consider the least objectionable. This latter drug may be given in cachets in doses of 3 to 10 grains, and antipyrin may be given in 5- to 10-grain doses, taking care that not more than 20 grains are given in a day. We have found caffeine of great service in diminishing the severity of attacks, if taken at the commencement. It may be given in grain doses, mixed with a little sugar of milk, every half hour, till 4 or 5 grains have been taken.

We have also found *guarana* useful in many cases. Sinkler recommends 10 grains of guarana with 5 grains of sodium salicylate to be given every ten or fifteen minutes, until three or four doses have been taken.

Many other drugs have been advised in this malady—and there can be no objection to giving them a trial—such as the hypodermic injection of hyoscyamin ($\frac{1}{50}$ grain); oil of eucalyptus in 5-minim capsules every half hour for four doses; sodium salicylate in 10-grain doses, given in combination with a dessert-spoonful of effervescing citrate of caffeine; aconitine, $\frac{1}{200}$ of a grain every hour; the prolonged use of galvanism as a preventive. Most patients find that one of the best remedies is *rest in bed* in a darkened room, and that they can often "sleep off" an attack. Whatever remedies we employ we should use rest as an auxiliary.*

Anæmic headaches.—Headaches occurring in women with the manifest symptoms of chlorosis and anæmia are described as *anœmic* headaches, but anæmia is by no means a necessary cause of headaches. In cases of *anœmic* headache there exists in all probability a special sensitiveness of the nervous system, together with some special defect in the action of the excreting glands induced by the anæmia; so that there is not only a defective nutrition of the nervous tissues, but irritation of them by defective elimination of toxic substances. The pain of these headaches is usually more or less continuous, not paroxysmal; although it suffers temporary aggravation and amelioration. The pain may be referred to the forehead, vertex or occiput. It is usually increased by mental or bodily effort, and relieved by rest in the recumbent position. Disturbed digestion, constipation, depression of spirits, drowsiness by day, insomnia at night, dizziness, and various neurasthenic manifestations, tend to accompany this form of headache.

The *indications* for **treatment** are to restore the blood to its normal condition, to relieve digestive troubles, and to promote due elimination by aperients, and suitable exercise and regimen. Change to mountain air (the seaside aggravates the digestive troubles in some cases), with regulated exercise, careful feeding, and hydrotherapy, is of great service. The general principles which we have laid down for the treatment of anæmia and chlorosis apply to these cases, and will not be here repeated. Suitable aperients are always needed. Iron and arsenic are the best tonics; the milder preparations of iron are fittest. If there is notable cardiac weakness, coca, strychnine, and occasionally small doses of digitalis may be needed. Opium should be avoided; it will relieve pain, but it interferes with elimination, and its use is neither physiological nor rational. Small doses of morphine and atropine given hypodermically may, however, occasionally be needed in the distinctly neuralgic forms. Nitro-glycerine has been advised in doses of $\frac{1}{200}$ to $\frac{1}{150}$ grain; it may give temporary relief. Inhalations of oxygen and of nitrous oxide have also been recommended, and they may be tried in exceptionally severe and troublesome cases. In neurotic cases a pill of valerianate of zinc (1 grain) and phosphorus ($\frac{1}{60}$ grain) twice a day, if taken for a few weeks at a time, will often prove of great service.

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* Formulæ for most of the remedies mentioned will be found at the end of this chapter.

We should be very cautious how we encourage the use of alcohol in these cases; the relief it affords can only be temporary, and the craving for it we may excite may be permanent. Tea, coffee, guarana, are all safe and useful remedies. One or two small doses (5 grains) of antipyrin or phenacetin may, in some cases, be given to relieve very severe attacks. Insomnia is best treated by 10- to 20-grain doses of sodium bromide, together with tincture of hop in half-dram or dram doses.

Cannabis indica, chloral, amyl nitrite, and various other drugs have been recommended.

Neurasthenic headaches are closely allied to the preceding. The so-called "clavus hystericus" refers to a form of pain in the head (the vertex) compared to that caused by driving a nail into it. These cases, when anæmia is present, require the same kind of management as the preceding. The neurasthenia must be treated in the manner described in a subsequent chapter. Massage to the head will sometimes give great relief to such cases.

Congestive headaches may arise from various causes—from over-indulgence in food and drink; from imperfect elimination and constipation in free livers; from pulmonary or cardiac conditions interfering with the venous return; and from suppression of habitual discharges, as at the menopause, etc. These headaches are distinguished by pulsation and throbbing of the vessels of the head, flushing of the face, and over-full superficial veins; by aggravation of the pain in the recumbent position; and by giddiness, and visual and aural sensory disturbances. Digestive troubles are often present.

The *indications for* **treatment** are, *first*, to correct the habits of life on which the state may depend; *secondly*, to relieve the circulatory disturbances, when possible, which may cause the congestion; *thirdly*, to promote free elimination; *fourthly*, to give immediate relief to the over-loaded vessels.

Sharp purging and the application of cold to the head in the form of an ice-cap will best fulfil the last indication. The application of leeches has been suggested, and so has compression of the carotids. Placing the feet and legs in hot mustard-and-water, or mustard plasters to the inside of the thighs (in women) are good derivatives. A mustard plaster to the nape of the neck is useful in some instances. A few doses of bromide are often valuable to allay cerebral excitement; but the therapeutic indications in this form of headache are causal, and we have little confidence in the use of analgesics. Most of these analgesic remedies have already been mentioned in the preceding sections, but it is clear they can only be palliative in cases such as we are now considering. A spare diet, the avoidance of stimulants, free action of the bowels, regular exercise, removal from business worries or overwork (mental or physical), a life in the open air, and a course of mineral waters, such as Carlsbad, Marienbad, Tarasp, or Kissingen—these are the rational means of relieving such hyperæmic conditions.

Toxæmic headache is a term which might possibly be applied with correctness to *all* forms of headache. The treatment of headaches associated with uræmia, malaria, plumbism, uricæmia, etc., cannot be considered profitably apart from the general conditions upon which they are dependent. To so-called *dyspeptic* or bilious headaches the same remark applies; the rational treatment of the headache is the treatment of the morbid state on which it depends. *Sympathetic* or *reflex* headaches, dependent on dental caries, on diseases of the nasal passages, on eye strain and errors of refraction, on ovarian disease and sexual derangement, offer no occasion for special comment in this place.

THE TREATMENT OF INSOMNIA.

Of the intimate nature of sleep, as a function of the brain, or of the precise changes in the brain upon which it is dependent, we have no accurate knowledge. It is difficult therefore to approach the subject of the remedial management of loss of sleep from a scientific standpoint. We know, however, many of the conditions, physical and mental, upon which the loss of sleep commonly depends, and we may hope that, in many instances, our efforts to remove or antagonise these conditions may result in its restoration.

We must especially recognise great differences, in what we may term **cerebral stability**, in different individuals. A slight irritation will suffice to produce cerebral instability and agitation in one individual, with consequent loss of sleep, which would be quite inadequate to induce any such disturbance in others. Most persons who have been distinguished by the faculty of great physical and mental endurance, and the power of sustained mental effort, have also been endowed with great cerebral stability. Great efforts may leave them with an exhausted brain, but with no great disturbance of its stability. In others, less happily endowed, mental efforts leave the brain not only exhausted, but irritated and unstable. The faculty, therefore, of resting and sleeping well, often, but not always, goes with the faculty of working well. A peculiar, and often inherited, hyper-sensitiveness of the nervous system, lies at the root of habits of sleeplessness, in many cases.

In considering the causes of insomnia we may divide them broadly into *physical*, *mental*, and a combination of the two.

Amongst the *physical* we should enumerate—(1) *physical pain*, or discomfort arising from injuries and diseases of bodily organs; (2) the brain excitement caused by the poisons of fevers and infective diseases; (3) the disturbances of brain function dependent on structural brain disease; (4) certain ingesta which, directly or indirectly, disturb that cerebral calm and stability which is necessary to sleep.

We might divide the *mental* into intellectual and emotional disturbances, although in many cases they are inseparable. Excessive intellectual efforts, when they lead to cerebral instability and irritation, are frequently associated with emotional influences; as the anxiety of competition, the struggle for some uncertain end, or the consciousness or dread of incapacity.

Emotional disturbances form the basis of the great majority of cases of insomnia—the passions of grief, anxiety, love, and the suspense and worries inseparable from social life.

It is clear that in this last class of cases our efforts to minister to their relief must be attended with very uncertain results.

In *neurasthenic* states we usually encounter a combination of mental and physical agencies co-operating in disturbing brain stability.

The **treatment** of the sleeplessness dependent on physical pain from neuralgic or other disease, or that dependent on febrile states, forms a part of the general treatment of such diseases, and is considered in other chapters.

We will here refer, in the first place, to the management of those cases of insomnia dependent on the ingestion of certain articles of food and drink, or on certain **food habits.** A very common and remediable cause of sleeplessness is the existence of some food habit which causes a disturbance of that physical and organic calm, at the hour of retiring to rest, which is needful, in the hyper-sensitive, in order to ensure sleep. The consumption of *cardiac excitants,* such as tea, coffee, and, with some persons, tobacco, late at night, will sometimes effectually prevent sleep by the circulatory disturbances produced. The excitement of digestive activity, or the disturbances of gastric function caused by taking a full meal late in the day, especially in persons prone to dyspepsia, is also a frequent cause of insomnia. Flatulent distension of the stomach, the irritation of gastric acidity, the upward pressure on the heart, and the palpitation thus excited, due to such improper habits of feeding, give rise to sleeplessness which will be avoided by adopting different habits.

In cases of acid dyspepsia and flatulence, even without the existence of the habits referred to, sleeplessness may often be prevented by drinking a tumblerful of hot water in which 10 to 30 grains of sodium bicarbonate is dissolved, a quarter of an hour before bed-time. We have found this a valuable expedient, in many cases, where gastric acidity was not suspected to be the cause of the insomnia.

Habitual constipation, when it is attended with flatulent distension of the intestines, will often cause sleeplessness from the discomfort arising from the upward pressure of the distended intestines on lying down in bed. The remedy for this is the removal of the habit of constipation.

Exhaustion from insufficient food is occasionally a cause of insomnia. When this is the case the consumption of a little light, nourishing food, with a small quantity of some suitable stimulant, before retiring to rest, will cure the sleeplessness.

Persons of studious habits, who work late in the evening and find they cannot sleep on retiring to bed, should discontinue their work, about an hour before bed-time, and take some out-of-door exercise.

Often some quite minor physical discomfort will start the habit of sleeplessness, such as insufficient warmth in bed; or the contrary, too great heat of the bed, but particularly *cold feet* in bed. When the latter is the case, the remedy is to bathe the feet in hot mustard and water just before going to bed, dry them with smart friction, and put on well-warmed woollen socks for night wear.

Massage, especially of the abdomen and lower extremities, will often induce sleep, possibly by diverting the blood to the vessels of those parts.

The methods of *hydrotherapy* are often successful in restoring sleep to the sleepless; but they are best carried out in an institution for the purpose, under a physician skilled in their application, as they require careful modification to individual cases.

In cases of nerve exhaustion, the application of electricity has proved useful.

But, too frequently, the treatment of insomnia resolves itself into the employment of some sedative or narcotic agent, and the important point is, to select that which will be the least harmful, and the least likely to establish an undesirable habit.

When the need of a narcotic is obviously temporary only, as for the relief of physical pain, or in the course of acute or other disease, we need have no hesitation in giving it; but it is quite otherwise when we are dealing with the subjects of habitual insomnia, who too often develop a craving for sleep-procuring drugs, and who cannot be trusted to use them cautiously and occasionally.

Alcohol has a well-known power of inducing sleep, and if we could be sure that there was no danger of producing the habit of alcoholic indulgence, we might find in it one of the least objectionable of narcotics. But, except in large quantities, it has little influence over obstinate cases. In slight cases, however, a glass of stout at bed-time, or an ounce or two of sound whisky with water, will frequently have the effect of inducing sleep. In other cases we have found from 1 to 3 drams of tincture of hop in an ounce or two of some aromatic water, at bed-time, answer well. It is often advisable, in giving alcohol to procure sleep, to give it half an hour or an hour before bed-time, so as to allow the preliminary excitement of its action to pass away.

We need not refer here to the value of *opium* for the relief of the insomnia due to painful disease. We have already and repeatedly dwelt on that subject, and we have only to say here that it is, of all the means at our disposal, the least desirable for the relief of the *habitual* cases we are now considering.

The least objectionable of hypnotics for the relief of simple insomnia are the *bromides*, and the sodium bromide is the best for this purpose. It may be given in doses of from 10 to 30 grains in an ounce of chloroform water, or it may be combined with a drachm or two of tincture of hop. It is of great value in the slighter emotional cases, and in many conditions of mental irritability.

Chloral is a very certain hypnotic, and is of immense service when it is of great importance to procure sleep quickly, and so avoid grave cerebral exhaustion from protracted sleeplessness; but it has the disadvantage of being a cardiac depressant, and the habit of chloral-taking may be quickly induced. It should be reserved for occasional, not habitual, use; and it should be always given combined with about an equal quantity of bromide of sodium or potassium; much smaller doses are then needed, and unpleasant after-effects are avoided. Fifteen grains will often suffice. A very popular American patent preparation contains chloral, potassium bromide, conium, and cannabis indica.

Chloralamide is a drug which is now used largely in the place of chloral, and it is regarded as a safer, though somewhat less powerful, hypnotic. The dose is 30 to 60 grains; and, as the taste is disagreeable, it is best given in capsules, or in solution with some aromatic tincture.

Sulphonal is, however, the most popular and is, perhaps, the safest of the modern hypnotics. It should be remembered that it is somewhat slow in producing its soporific effect, and it should be taken some time before sleep is desired. If taken on going to bed, it may be some hours in acting, and the patient may suffer from sleepiness the whole of the next day. Its soporific action has been observed to extend to the next night, and for this reason it has been advised that it should only be administered on alternate nights. Its combination with potassium bromide may be warmly commended; 10 to 20 grains of sulphonal with 20 grains of bromide in a cup of warm broth, milk, or chocolate, should be taken an hour before bed-time. Another method of giving sulphonal, which has been found useful, is to give half the dose (7½ to 10 grains) about an hour before late dinner, and the other half at bed-time. If dissolved in boiling water, it is found to act more quickly. Some have prescribed it mixed with whisky-punch.

Tetronal and *trional*, bodies allied to sulphonal, are better tolerated than the latter by some patients, and may be given in the same manner and in the same dose.

Paraldehyde is also a valuable hypnotic and free from unpleasant after effects, except that of imparting a most disagreeable odour to the breath, which greatly interferes with its general adoption. It is given in doses of 1 dram and upwards, and usually acts with rapidity.

Chloroform and *ether* are reserved for those cases of sleeplessness associated with some spasmodic affection which the anæsthetic allays.

Hypnotism has been suggested for the relief and cure of insomnia, but it is a method for which we have a profound mistrust, surrounded as it is with subtle dangers, and it has failed conspicuously in the cases in which we have seen it applied.

Formulæ for the administration of the chief hypnotics will be found amongst those appended to this chapter. The most difficult cases to deal with are those dependent on some far-reaching emotional disturbance. For these, travel, change of climate, change of life (especially a life in the open air), hydrotherapy combined with massage and electricity, are the best remedial measures; and drug treatment is probably the worst.

The treatment of neurasthenic cases is dealt with in a subsequent chapter.

In conclusion, we would earnestly impress on all who have to deal with this troublesome condition, the great importance of avoiding having recourse to hypnotic drugs except in cases of urgent necessity. There are many other resources, as we have here pointed out, for dealing with this state; and these, if judiciously urged, and combined with a little patience, will often succeed in overcoming this habit, without inducing another, which is, perhaps, a greater evil—the habit of taking narcotic drugs.

ADDITIONAL FORMULÆ.

For migraine.

℞ Sodii salicyl., 45 grains.
Sacchari lactis, 30 grains.

M. et divide in pulv. 6. A powder every hour at the time of the attack. (*Bamberger.*)

Another.

℞ Caffeinæ bromhydrat., 15 grains.
Quininæ bisulphat., 22 grns.
Sacchari alb., 30 grains.
Ol. menthæ pip., 1 drop.

M. et divide in pulv. 10. Three to be taken in the day. (*Bamberger.*)

Aperient pills in migraine.

℞ Quininæ sulph., 15 to 30 grns.
Extr. aloes aquosi, 75 grains.
Pulv. et extr. glycyrrhizæ, q.s.

Ut f. pil. 60. Two night and morning. (*Bamberger.*)

For migraine.

℞ Phenazoni (antipyrin), 1½ dram.
Potassii bromidi, 4 drams.
Spirit. chloroformi, 2 drams.
Aquæ camphoræ ad 8 oz.

M. f. mist. A large tablespoonful when the attack comes on, and a dessertspoonful every morning and evening between the attacks. (*Whitla.*)

For migraine.

℞ Quininæ sulph., 15 grains.
Caffeinæ citratis, 15 grains.

M. et divide in pulv. 6. One for a dose during the attack. (*Benedikt.*)

In the intervals.

℞ Sodii bromidi, 5 drams.

Divide in pulv. 20. Take one night and morning. (*Benedikt.*)

Pills to be taken in the intervals of attacks of migraine.

℞ Sodii arseniatis, 2 grains.
Extr. cannabis indicæ, 4 grns.
Extr. belladonnæ, 8 grains.
Zinci valerianatis, 48 grains.

M. et divide in pil. 24. One to be taken after breakfast and dinner. (*Little.*)

For the same.

℞ Extr. cannabis indic., ⅛ grain.
Extr. nucis vom., ¼ grain.
Ergotini, 1 grain.

M. f. pil. To be taken three times a day after meals.

Or,

℞ Extr. cannabis indicæ, ⅙ gr.
Pulv. digitalis, ½ grain.
Ferri lactatis, 2 grains.

M. f. pil. To be taken three times a day after meals.

(This and the above are intended for prolonged administration.) (*Prof. Wharton Sinkler.*)

For syphilitic headaches.

℞ Sodii iodidi, 1½ dram.
Morphinæ hydrochlor., 1½ to 2 grains.
Ex. et pulv. glycyrrhizæ, q.s.

Ut f. pil. 60. Four pills night and morning (to be kept in orris powder).

And

℞ Hydrargyri perchlor., 1½ gr.
Sodii chloridi, 9 grains.
Aquæ, 2½ drams.

M. f. solut. For hypodermic injection. (*Benedikt.*)

For anæmic headache, with uterine disorder.

℞ Ammonii bromidi, 1 oz.
Tinct. cannabis indic., 1 drm.
Mucilag. acaciæ, 4 oz.
Spr. menthæ pip., 2 drams.

M. f. mist. A teaspoonful in water three times a day. (*Hamilton.*)

For sympathetic headache of ovarian disease.

℞ Ammonii bromidi, 6 drams.
Extr. hydrastis fluid., ½ oz.
Tinct. gentianæ comp., 1½ oz.
Aquæ, 4 oz.

M. f. mist. A dessertspoonful three times a day. (*Sinkler.*)

In hyperæmic headaches.

℞ Sodii bromidi, 6 drams.
Spr. ammon. arom., ½ oz.
Inf. gentianæ comp., 3 oz.

M. f. mist. A teaspoonful in ice-water every half-hour until relieved. (*Sinkler.*)

For hysterical headaches.

℞ Zinci valerianatis, 12 to 24 grains.
Extr. belladonnæ, 3 to 5 grs.
Extr. gentianæ, 24 grains.

M. et divide in pil. 12. One three times a day. (*Tanner.*)

For nervous headache.

℞ Tinct. hyoscyami, ½ oz.
Spr. ammon. arom., ½ oz.
Syrupi aurantii, 1 oz.
Aquæ menthæ pip., 2 oz.

M. f. mist. A tablespoonful for a dose. (*Wright.*)

In simple insomnia.

℞ Lupulini, 3 grains.
Camphoræ, 3 grains.
Extr. hyoscyami, 3 grains.

M. et f. pil. 2. To be taken at bed-time. (*Steward.*)

Or,

℞ Tinct. lupuli, 1 to 2 drams.
Sodii bromidi, 15 grains.
Aquæ chloroformi ad 1½ oz.

M. f. haust. To be taken at bed-time.

For insomnia with flatulent dyspepsia.

℞ Sodii bicarb., 20 grains.
Spr. ammon. arom., ½ dram.
Spr. chloroformi, 20 minims.
Aquæ menthæ pip. ad 1½ oz.

M. f. haust. To be taken at bed-time with an equal quantity of hot water.

Insomnia with mental excitement.

℞ Hyoscin. hydrobromatis (Merck), ⅓ grain.
Tinct. aurantii, 1 oz.
Aquæ destill., 3 oz.

M. f. mist. A teaspoonful at bed-time. (*Whitla.*)

Elixir of paraldehyde for insomnia.

℞ Paraldehyde, 2½ drams.
Tinct. vanillæ, ½ dram.
Spr. vini rect., 1½ oz.
Aquæ destill., 1 oz.
Syrupi simp. ad 5 oz.

M. f. elixir. One or two tablespoonfuls for a dose. (*Yvon.*)

A hypnotic draught.

℞ Chloral. hydratis, 30 grains.
Potassii bromidi, 35 grains.
Liq. morphinæ bimecon., 30 minims.
Syrupi aurantii flor., 4 drms.
Aquæ destill. ad 3 oz.

M. f. haust. Half to be taken at bed-time, and the remainder in three hours, if necessary. (*Whitla.*)

Another.

℞ Paraldehyde, 1 dram.
Mucilag. acaciæ, 2 drams.
Syrupi simp., 2 drams.
Aquæ cinnam. ad 2 oz.

M. f. haust. To be taken at bed-time. (*Whitla.*)

CHAPTER V.

THE TREATMENT OF CHOREA.

Chorea, its Nature and Characteristic Symptoms—Causation—Relation to Acute Rheumatism and Endocarditis—to Emotional States—Microbic Theory—Influence of Educational Strain—*Treatment*—Rest and Food—Drugs—Sodium Salicylate—Strychnine—Antipyrin—Physostigmine, etc., etc.—Rest Cure—Baths and Douches—Gymnastics—Massage—Electricity—Value of Arsenic—Zinc Compounds—Sedatives and Hypnotics—Cimicifuga—Conium—Hyoscine—Bromides and Chloral—Chloralamide—Sulphonal—Morphine—Chloroform Inhalation—The "Wet Pack"—Ether Spray—Generalities. Additional Formulæ.

CHOREA is a **neurosis** of **early life** the pathogeny of which is still involved in obscurity. It has been described as a form of functional exhaustion of the central nervous system, associated with vascular disturbances affecting the motor tract in the brain and spinal cord. It would seem, however, to be rather a morbid *irritability* or excitement of the motor centres, which no doubt may lead eventually to functional exhaustion.

It is readily distinguished by its highly characteristic **symptoms,** the chief of which depend on frequent, irregular, involuntary movements of various groups of muscles, especially those of the arms, legs, face, and tongue, and in some cases of the muscles of the trunk also. The irregular action of these muscles causes the arms and hands to move about in an odd purposeless fashion; the legs and feet also keep moving and shifting their position; the facial muscles by their irregular contractions give rise to all kinds of grimaces and gestures; the tongue is suddenly protruded and retracted, without any object, and the eyes are rolled about, and the head turned from side to side. When the muscles of the trunk are also involved, as is the case in severe forms, the whole body may be moved and tossed about in bed, so that the elbows and other bony prominences get bruised and excoriated. It occasionally happens that the choreic movements are almost, if not quite, limited to one side of the body (hemichorea). Even in the slighter cases all the voluntary movements are disturbed, interfered with, and often perverted by the uncontrollable irregular actions of the muscles, so that all voluntary actions are performed awkwardly and with effort. The power of speech is lost, or greatly interfered with, in all but the slighter cases. There is usually much restlessness and sleeplessness, and these symptoms may become so pronounced as to be of serious import, and, combined with violent muscular movements, may lead to a fatal result from exhaustion. Considerable emaciation from inability to take food occurs in these graver forms. These irregular involuntary movements usually cease during sleep, and from this circumstance it has been inferred that the motor excitement or disturbance must be cerebral and not spinal. It is almost exclusively a neurosis of *early* life, and is especially prone to occur between the ages of 5 and 15. It is extremely rare after 20. It is most common at the age of 13. It is also far more common in girls than boys. Osler's statistics, which accord fairly with those of other observers, give girls 71 per cent. and boys 29 per cent.

Chorea is very frequently associated with the existence of **cardiac murmurs,** especially a systolic murmur over the mitral area, and although in some cases, doubtless, these murmurs may be functional and hæmic, yet there seems good reason for believing they are more commonly caused by co-existing or pre-existing endocarditis, and that they indicate mitral incompetence. Chorea is also frequently preceded by a history of **acute rheumatism.** This brings us to a very troublesome and difficult point in the pathological history of this disease—viz. to determine the precise relation of chorea to rheumatism and endocarditis. Those who go so far as to regard chorea as in all cases a rheumatic disease, and dependent on rheumatic endocarditis, and its characteristic manifestations as determined by emboli—particles of fibrin and vegetations—detached from the surface of the inflamed valvular endocardium and carried into the cerebral vessels, encounter serious difficulties in attempting to establish their position.

In the first place, it is common to observe rheumatic endocarditis in children without any symptoms of chorea, and such symptoms do not ordinarily occur even in those cases of *ulcerative*, and other forms of endocarditis, in which we know that emboli are conveyed from the cardiac valves into the vessels of various organs. Again, if choreic attacks were caused by the conveyance of emboli from the cardiac valves into the vessels of the brain, we ought in these cases to find evidence also of the lodgment of emboli in other organs, as the spleen and kidneys, where they are most commonly arrested, and this we do not find.

Then the statistics of the co-existence of rheumatism and chorea, and the antecedent occurrence of rheumatism to chorea, collected by different investigators differ very widely. American physicians give the proportion as 17 to 21 per cent., German observers make it much lower than this, and some English and French physicians much higher. Prof. G. Sée estimates the proportion at nearly 50 per cent. The results of the Collective Investigation of the Committee of the British Medical Association gave about 26 per cent.

Thus we have a vast proportion of all cases of chorea which cannot in any way be traced to antecedent rheumatism; and while some may be disposed to lay great stress on the fact that rheumatism has been observed in 26 per cent. of cases of chorea in England, others may be excused for giving also great weight to the observation that in 74 per cent. no such relationship has been discovered.

We have also to weigh the undoubted fact that attacks of chorea not infrequently come on *immediately* after some **emotional** disturbance—most commonly fright of some kind—and that it occurs in about the proportion of 3 to 1 in the more emotional sex.

Osler asks the question "Do these articular affections of chorea belong to true rheumatism? Are they not analogous to the joint troubles of scarlet fever, puerperal fever, and gonorrhœa, which no one now regards as truly rheumatic?" In this connection it may be mentioned that a *microbic* origin of chorea has been suggested, and it has been urged that as it is impossible in many cases where endocarditis and chorea co-exist to refer the chorea to endocarditis or the endocarditis to rheumatism, they both may have their origin in a common cause—viz. some infectious agent, which is capable also, in persons predisposed, of exciting articular disease. It has been observed by Osler that scarlet fever, with articular manifestations, has been found to be a direct antecedent to chorea in 25 per cent. of cases.

We must then, for the present, be content with the fact that there certainly is a close relationship between chorea and acute rheumatism, and that, as Fagge has pointed out, "these two disorders are the chief and almost the only causes of valvular endocarditis." We should also note that endocarditis, with disease of the mitral valve, has been found to exist in nearly all fatal cases.

Chorea occasionally occurs in young pregnant women, usually in first pregnancies, and between the second and fifth months; in these cases it often assumes a severe form, and may probably be referred to an emotional origin, from the circumstance that it generally occurs in the *unmarried.*

Although **anæmia** has been advanced as a cause of chorea there seems to be no sufficient basis for this statement; it is apt to occur in chlorotic girls at the period of puberty, and it may itself lead to anæmia, but anæmia must not be looked upon as affording anything more than a predisposition to the disease. *Educational* **strain** and the emotional disturbances inseparable from school and college competitions seem to be a fruitful cause of chorea in girls. It would also seem to depend sometimes on inherited predisposition, and to be apt to occur in highly-strung, excitable children. It has sometimes been observed to follow injuries and slight surgical operations.

From the preceding brief reference to the etiology and pathology of chorea, it will be seen that we can be scarcely said to possess any *causal indications* for *treatment.*

Rest and **good feeding** are sufficient, it has been maintained, to cure the large majority of cases of chorea, and these are undoubtedly most important conditions of cure; but so long as the physician bears in mind the fact, that even the slighter forms of this affection may develop into the graver and uncontrollable ones, he will be anxious to adopt whatever therapeutic measures are available, to prevent so serious a possible development of the malady. The **indications,** then, for the **treatment** of cases of chorea may be thus stated:—

1. To rapidly relieve, if possible, the slighter forms, so as to prevent their development into the graver forms, or their passing into a chronic state.
2. To relieve restlessness and sleeplessness, and so obviate fatal exhaustion in the more severe cases.

Of the vast array of drugs that have been proposed in the treatment of chorea there are many which may be dismissed very briefly. Apomorphia, lobelia, belladonna, cypripedium, cannabis indica, aniline, picrotoxine, amyl nitrite, and tartarised antimony, may be at once rejected, as more likely to do harm than good. Of the salicylates and the iodides, we have only to remark that they may serve as remedies for co-existent rheumatism, but that they have not appeared to us to have any special value in the treatment of chorea. Sodium salicylate has, however, been administered as a germicide on the hypothesis that chorea is due to microbic infection.

Strychnine has the high authority of Trousseau to recommend it; and, we believe, its administration may be valuable in cases where symptoms of nervous exhaustion and cardiac debility, rather than those of nervous irritation, predominate; and as a cardiac and nervine tonic, after the choreic symptoms have to a great extent passed away, it may also be useful; but for the central excitement and irritability, upon which the more serious choreic phenomena depend, we do not regard it as a suitable remedy.

Antipyrin and antifebrin have both been advocated for the treatment of chorea, as depressants of the excito-motor functions of the spinal cord. The latter we should unhesitatingly condemn as a dangerously depressing drug; and we are not greatly impressed with the suitability of the former. It is, however, only right to say that so good an authority as Dujardin-Beaumetz commends its use, and advises that it should be given to children in doses of 15 to 30 grains daily, and he suggests that gymnastics and hydrotherapy should be employed at the same time; but he refers to cases that are well enough to walk about,* and these are precisely the kind of cases that are found to get well without any drug treatment. Other competent observers have not been favourably impressed with the value of this remedy; but Goodhart reports having given it in doses of 5 grains thrice daily with advantage. Ardeber gave as much as 45 grains of this drug daily, and Moncorvo as much as 90 grains, with success. Bouchut recommended physostigmine, and gave it in a vast number of cases of chorea with, apparently, remarkably good results, curing cases, on an average, after eight days of treatment. He gave the sulphate in pills, in doses of 2 to 5 milligrammes (about $\frac{1}{40}$ to $\frac{1}{15}$ grain). Dujardin-Beaumetz condemns it as a dangerous drug, and its use appears to have been almost entirely abandoned. It is apt to cause great nausea, and to give rise to symptoms of paralysis of the diaphragm!

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* "Clinique Thérapeutique," vol. iii. p. 239.

We are disposed to add to this list of undesirable, or uncertain, so-called remedies for chorea, the nitrate and oxide of silver and the sulphate of copper.

We have thought it right to mention these various drugs, as they have all of them received more or less credit, from different observers, in the treatment of chorea, and in some troublesome and intractable cases, others may wish to give some of them again a trial.

We shall now consider those remedies which appear to us more worthy of confidence; and we would place, first of all, what has been termed the **"rest plan"**—rest for a certain time, wholly, or partially, in bed, according to the severity of the case, together with light, but supporting, food. At first the rest should be *absolute*, and no occupation, even by way of amusement, should be permitted. If practicable, it is best to confide the child to the care of a nurse, apart from the rest of the family. As the patient improves a little exercise of the mildest kind may be allowed. In fine warm weather the patient may be swung in a hammock, or may recline on a couch, in the open air. Rest allays nervous and muscular irritability; and if endocarditis exists, by quieting the action of the heart and reducing its labour, it reduces the strain on the valve segments to a minimum. Educational tasks must not be thought of until long after the cure has been complete. Indeed, as a preventive, or to arrest the tendency to recurrence, all neurotic and sensitive children should be protected from educational strain and worry. The food should be nutritious, but simple, and such as can be easily digested. While the patient is in bed an exclusive milk diet may be appropriate; and if milk is not well borne, koumiss has been found to answer well; but a mixed diet of eggs, fish, meat, and milk is often well tolerated. Sweets must be avoided, and so must too much farinaceous food.

While referring to the matter of food, we may add that, in those severe cases in which feeding by the mouth is difficult, nutrient enemata must be given. A daily warm bath of ten to fifteen minutes' duration, followed by the quick passage of a cool wet sponge down the spine, will be found very quieting; and in somewhat chronic cases, in young chlorotic or hysterical girls, without any cardiac complication or rheumatic tendency, a tepid or cold douche to the spine every morning for 15 seconds will often be found to be followed with vast improvement. The water should, at first, be tepid, and the temperature gradually lowered. In summer the water can often be used at once of the natural temperature. Sulphur baths have been found useful in rheumatic cases.

Gymnastics and *massage* have their uses also in the treatment of chorea; the latter may be serviceable for stout anæmic patients, whose muscular movements are not sufficiently under control to benefit by gymnastics, which are only suitable to slight or chronic cases, with but little muscular inco-ordination. The gymnastic movements suitable to the treatment of chorea are rhythmic ones with the accompaniment of singing.

We have had but little experience of the application of *electricity* to the cure of chorea; but Dr. Constantin Paul has applied the electric bath with advantage in certain cases, and Prof. Rockwell, of New York,* states that "when a case has continued without amelioration for several months" he regards "electricity in some form far superior to any and all other methods of treatment." He uses both "general faradisation and central galvanisation; the ascending current is to be preferred in the treatment of chorea located in a single muscle or group of muscles, and general faradisation is far more efficacious when the disturbances are at all general. If the applications are skilfully made, they will act both as a tonic and as a sedative, to allay irritability and induce sleep." Skilful application is, no doubt, cf great importance, and when this cannot be ensured electrical treatment had best be left alone.

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* Hare's "System of Practical Therapeutics," vol. i. p. 174.

Of medicinal agents applicable to the treatment of chorea, the following merit especial consideration :—

Arsenic ; the Zinc compounds.
Conium ; Cimicifuga ; Hyoscine.
The Bromides ; Chloral ; Chloroform.
Ether spray to the spine.
Certain cardiac tonics.

There is a general consensus of opinion as to the value of **arsenic** in the treatment of chorea. It probably acts as a tonic and improves the general nutrition ; but the large doses needed, in many cases, in order to ensure its beneficial effect, lend some support to the suggestion, that it may exert a special influence either over the nerve cells involved or over some possible microbic irritant in the system. It is usual to begin with a full dose of 5 minims of Fowler's solution thrice daily, and to increase the dose by 1 minim daily until it reaches 15 minims. This dose should be continued for about a week and then again increased, every three or four days, until the physiological effects of the drug become manifest; the arsenic should then be discontinued for a few days. Tolerance is soon established, and the medicine may be again resumed in full doses. Seguin has given as much as 27 minims for a dose, which he prescribes, diluted in a large quantity of water, and taken in divided drinks after meals. It may be given in water flavoured with a little syrup of orange or lemon peel. Sachs judiciously suggests that the night dose should be combined with a dose (15 or 20 grains) of potassium or sodium bromide. Dujardin-Beaumetz prefers to give the arsenic by the hypodermic method, as he considers he thus obtains more quickly the full remedial effect with much smaller doses. He injects from 1 to 4 or more minims of Fowler's solution mixed with 15 minims of liquid vaseline. This mixture, he maintains, causes no irritation.

Next, perhaps, to arsenic in value we should place the **zinc** compounds; the sulphate, the oxide, the valerianate, and the phosphide, have been used. The oxide or the sulphate may be given in doses of 3 to 5 grains, after a meal, three or four times a day, and the dose may be gradually increased to 8 or 10 grains. The phosphide is indicated only in cases of great nervous exhaustion; it may be given in doses of $\frac{1}{20}$ to $\frac{1}{10}$ of a grain three times a day in a pill with 1 or 2 grains of extract of hyoscyamus.

The valerianate in 1- to 3-grain doses, thrice daily, made into a pill with extract of henbane in the same way, we have found answer exceedingly well in cases where arsenic appeared to exercise but little beneficial effect. Indeed, we have found this drug often answer better than arsenic in florid, well-nourished children, whose chorea has been apparently of rheumatic origin, as well as in some hysterical forms.

The usefulness of sedatives and hypnotics in the severer cases cannot be doubted; and even in the slighter cases, if they are accompanied by insomnia, and nocturnal restlessness, we hold it as an indication of the first importance to procure sleep. If we neglect this indication, we must be prepared to see the slighter cases often develop into the graver and more troublesome forms.

Both cimicifuga and conium are of use in the treatment of chorea; the former is more valued in America than in England. Sachs * says: "The only substitutes for arsenic which are of decided value are the tincture of cimicifuga and conium; the former is my first choice if arsenic cannot be given." In young and delicate children he begins with a dose of 15 or 20 minims after meals and gradually increases up to 60 minims; in adults he begins with 20 minims and increases the dose to 60 or 70.

Conium is especially valuable on account of its sedative properties, and is, therefore, applicable to cases accompanied by restlessness and insomnia; but its quieting action is brief and evanescent, and larger and still larger doses are needed to maintain its influence; the succus conii has been given in from 1- to 7-drachm doses hourly. It is chiefly as a temporary expedient that it is of use, and Whitla states that in one case he considers it "kept the child alive until the arsenic had time to act."

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* Hare's "System of Practical Therapeutics," vol. iii. p. 232.

Hyoscyamus, or hydrobromate of hyoscine given hypodermically, in doses of $\frac{1}{100}$ to $\frac{1}{60}$ of a grain, is, according to Sachs's large experience, the most efficient remedy for arresting the exhausting movements in the severer cases. This drug, he says, should be pushed until its physiological effects (dryness of the mouth and dilatation of the pupils) are observed. The dose of $\frac{1}{100}$ grain several times daily will usually suffice.

Hypnotics are also urgently indicated when there is sleeplessness. Rest to the nervous system must be obtained if we would avoid the risks of fatal exhaustion. In the milder cases a few doses of sodium or ammonium bromide (10 to 20 grains) combined with chloral (10 to 20 grains) given at bed-time and repeated during the night, if necessary, will often be attended with remarkable amelioration of the general symptoms and natural sleep will follow without the need of further repetitions of this dose.

In more severe cases larger and more frequent doses may be necessary, and rectal injections of chloral have been found very useful—10 to 30 grains dissolved in 2 or 3 ounces of water thrown into the rectum every five or six hours, if necessary.

Bouchut gives 45 grains of chloral after the morning meal so that the child may sleep till noon, and 45 grains more after its mid-day meal; the child usually wakes up about six for his supper and falls asleep again afterwards; in this way he sometimes keeps the choreic child asleep during several days.

Chloralamide has been found efficacious as a hypnotic in 10- to 30-grain doses, and so also has sulphonal; but neither of them acts so rapidly as chloral.

It is rarely advisable to give morphine or opium until other drugs fail in procuring sleep. They should then be given with great caution and preferably by the mouth, as morphine administered hypodermically sometimes produces a very depressing effect on the heart.

In the gravest cases, when the movements are very violent and uncontrollable, and the patient can with difficulty be retained in bed, and the prominent parts of the body become bruised and excoriated, inhalation of chloroform may be needed; we should push the inhalation to complete narcotism, otherwise the patient will soon reawaken, and the amount of chloroform ultimately consumed will be greater. Osler advises the "wet pack" in these cases as likely to prove very soothing.

Hypnotics should be discontinued as soon as possible.

Dujardin-Beaumetz, following the example of Lubleski, of Warsaw, approves of the application of ether spray along the spine for five minutes at a time. Applied night and morning by means of a Richardson's apparatus, he considers it often diminishes the intensity of the choreic movements.

A prolonged lukewarm bath at night has also been found very calming and has relieved insomnia.

It is still necessary to add a few generalities. Alcohol, in moderation, should be given in severe cases when exhaustion is threatened. The bowels should be kept regularly relieved by mild aperients. Anthelmintics should be given if there is any reason to suspect the existence of intestinal worms. In anæmic cases, and in convalescence, iron and other tonics, such as quinine and strychnine, will be needed. Cardiac tonics, such as digitalis and strophanthus, may also be required if the heart's action is feeble and when valvular disease exists. Should cases tend to become chronic, notwithstanding treatment by rest and seclusion, change of air and scene should be prescribed. Guard carefully against recurrence, especially during the spring,* by protecting the rheumatic from chill, and the sensitive and neurotic from all over-exertion or strain, mental or physical, and look to the maintenance of the due nutrition of the body.

ADDITIONAL FORMULÆ,

Oxide of zinc in chorea.

℞ Zinci oxidi, 3 to 6 grains.
Sacchari alb., 75 grains.

M. et div. in pulv. 6. A powder three times a day. (*Bamberger.*)

Hypodermic injection of arsenic.

℞ Sodii arseniatis, 1½ grain.
Acidi carbolici, 3 minims.
Aquæ destill., 2½ drams.

M. f. solutio. Initial dose for hypodermic injection = five minims. (*Widerhofer.*)

Arsenical mixture for chorea.

℞ Liquor. Fowleri, 30 to 45 minims.
Syrupi simp., 1 oz.
Aquæ ad 8 oz.

M. f. mist. A tablespoonful 3 times a day. Also application of constant current along spine. (*Benedikt.*)

Bromide of potassium pills for chorea.

℞ Potassii bromidi, 75 grains.
Pulv. et extracti glycyrrhizæ, q.s.

Ut f. pil. 20. Five pills twice a day. (*Bamberger.*)

Also,

℞ Chloral. hydratis, 75 grains.
Syrup. aurantii, 1½ oz.
Aquæ ad 4½ oz.

M. f. mist. A tablespoonful every hour until a sedative effect is produced. (*Bamberger.*)

Iron and arsenic mixture.

℞ Tinct. ferri perchlor., 2 drs.
Liq. arsenicalis, 3 drams.
Glycerini, 1 oz.
Aquæ chloroformi ad 5 oz.

M. f. mist. A measured teaspoonful in water after food three times a day. (*Whitla.*)

Quinine, iron, and arsenic, for chorea.

℞ Ferri redacti, 1 to 3 gr.
Quininæ sulph., 2 to 5 gr.
Acid. arseniosi, $\frac{1}{60}$ to $\frac{1}{30}$ gr.

In a pill or capsule, thrice daily. (*Sachs.*)

Tonic powders in chorea.

℞ Quininæ sulph., ¾ grain.
Ferri carb. saccharat., ¾ gr.
Sacchari albi pulv., 5 grains.

M. f. pulv. To be taken twice a day. (*Widerhofer.*)

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* Weir Mitchell recommends that arsenic should be given as the spring begins in cases where there is a fear lest "the habit of vernal recurrence of chorea" should be established. ("Lectures on Diseases of the Nervous System.")

CHAPTER VI.

THE TREATMENT OF EPILEPSY.

The different Forms of the Attack—Etiology—Warnings—Aura—*Petit Mal—Treatment:* (1) During the Paroxysm; (2) of the Pre-paroxysmal Stage; (3) in the Intervals—Preventive Measures in Predisposed Children, and Hygienic Treatment—Alkaline Bromides—Mode of Administering them—Bromism—Other Bromides—Borax—Boric Acid—Belladonna—Zinc Compounds—Copper and Silver Salts—Digitalis—Cannabis Indica—Chloral—Nitrites—Sulphonal—Antipyrin—Acetanilide—Treatment of *Syphilitic, Strumous,* and *Anæmic* Cases—*Management of Complications*—Coma—The *Status Epilepticus*—Surgical Treatment. Additional Formulæ.

By **epilepsy** is meant a disease of the nervous system, characterised by attacks of unconsciousness, with or without convulsions. These attacks, or "fits," as they are termed, are apt to *recur*, in a paroxysmal manner, at irregular intervals. When they take the form of a very brief loss of consciousness, without convulsions, the disease is known as the *petit mal;* when, on the contrary, the loss of consciousness is attended with general convulsions, the disease is spoken of as the *grand mal. Epileptiform* convulsions—that is to say, convulsive attacks having a general resemblance to epilepsy, may occur as symptomatic of various forms of disease of the nervous system—as, for example, of syphilitic disease—but these are not regarded as instances of "idiopathic," or true epilepsy. Localised convulsions, without loss of consciousness, generally connected with definite cerebral lesions may also occur, and they are known as cases of Jacksonian epilepsy.

As to the **causes** of epilepsy; childhood and youth are certainly predisposing ones. It begins frequently during childhood, and also about the age of puberty, and but rarely after 25 or 30. It is generally considered that epileptiform convulsions, occurring in the adult, should be regarded as very probably due to syphilis or some other *local* lesion.

The influence of heredity as a predisposing cause of this disease is somewhat variously estimated by different authorities, but even those who regard hereditary influence as playing but a small part in the *direct* transmission of epilepsy, admit that the children of *neurotic* parents, those prone to suffer from migraine, neuralgia, hysteria, and insanity, are especially liable to become epileptics. *Alcoholic habits* in the parents seem to convey a decided predisposition to epilepsy in their children.

Whether *syphilitic* parents can convey to their children a tendency to this disease, in its idiopathic form, is doubtful; but *symptomatic* epileptiform convulsions are frequently dependent on actual syphilis of the nervous system, which may be either transmitted or acquired.

Emotional shock, such as fright or anger, appears to be capable of inducing attacks of epilepsy; masturbation and sexual and alcoholic excitement are also recognised causes. Epileptic seizures from injury (traumatic cases) or irritation (reflex cases) of the nervous system are not uncommon.

Dentition, menstruation, intestinal worms, dyspepsia, gall-stones, small surgical operations, have all been cited as exciting causes of epileptic convulsions. The removal of carious teeth, in persons afflicted with epileptic attacks, has been repeatedly observed to be followed by a cessation of the fits.

It is unnecessary here to describe, in detail, the familiar phenomena of an epileptic seizure, but a few words will not be out of place on the occurrence of the so-called **aura** premonitory of the approaching attack, on some *post*-epileptic symptoms, and on the character of the attacks of *petit mal.* The epileptic *aura* is a localised sensation of a somewhat vague character occurring sometimes in the hand, or in a finger or toe, or in the epigastric, or cardiac regions, and in the latter attended with heart-burn or palpitation; or it may be referred to a tender spot on some other part of the surface of the body. Disturbed conditions of the special senses may produce visual (flashes of light), auditory (noises and sounds), olfactory (unpleasant odours), and gustatory (disagreeable tastes) *auræ*. A strange dreamy state, or one of fear and dread, may also precede the attack. Or certain motor *auræ* may be observed, such as rotatory or running movements.

These epileptic auræ may last from a few seconds to several minutes, or even longer, and it has been a question whether, on the observance of these warnings, the attacks might not, in some cases, be prevented; as they have been noted to sometimes occur, and pass away, without the supervention of fits.

A loud scream or yell usually indicates the onset of the epileptic convulsions and state of unconsciousness.

After the attack has passed away the epileptic is sometimes left in a curious trance-like condition, in which he is not responsible for his actions; he retains no recollection of them, and in this state homicidal tendencies (mania) are occasionally developed. Sometimes transient hemiplegia and defects of speech may follow an attack, and sometimes much mental feebleness may be the result. It is important to remember that epileptic attacks may occur at night without the patient being aware of them.

Attacks of **petit mal** frequently assume such a variety of forms that their nature is, no doubt, often misunderstood and unrecognised. The attack may be of such brief duration, the patient continuing to perform automatic actions, that it may pass unnoticed by the bystanders, or the patient may stagger and catch at something for support, or he may feel giddy and sit or lie down, or he may interrupt whatever he is engaged in for a minute or two, and then go on again as though nothing had happened.

A vacant stare, with slightly dilated pupils, and some pallor of the face are often the only noticeable signs of such an attack. We should remember that what are termed "fainting fits" in children are often of this nature. Occasionally slight convulsive twitchings of certain muscles of the face and neck accompany these minor attacks.

The pathology of epilepsy still remains obscure, and the *principles of treatment* of this affection must be based rather on observation of the phenomena of the attack, and on the results of experience, than on the theories of pathologists.

The **treatment** of the epileptic may be regarded from three points of view: (1) the treatment during the paroxysm; (2) the treatment when the paroxysm is imminent, what may be termed the pre-paroxysmal stage, and (3) the treatment in the intervals.

(1) The treatment during the paroxysm is simple. The patient should be placed reclining on some soft, flat surface, where he cannot do himself any injury during the violent convulsions. As the tongue is apt to be badly bitten by getting between the firmly-closed teeth, it is advisable to place between the teeth a bit of stout indiarubber tubing, or a wedge-shaped piece of strong cork, or something which will not be hard enough to injure the teeth, while it is tough enough to resist being bitten in two and swallowed. The head should be slightly raised, and all tightly-fitting clothes loosened.

It has been said that an epileptic attack can sometimes be cut short by pressing on the carotid artery in the neck. Fagge mentions that the late Mr. Stocker, of Guy's Hospital, was in the habit of pressing both thumbs into the neck, one on each side, towards the spine, and that this was occasionally attended with a rapid return of consciousness, "at least when the case was hysterical." This method is now rarely employed, and we have little confidence in its efficacy in cases of true epilepsy. Inhalations of nitrite of amyl (5-minim capsules) have been credited with the power of lessening the convulsive movements, and there can certainly be no objection to trying its effect, especially when the convulsive movements are violent or prolonged. Inhalations of chloroform, and hypodermic injections of morphine ($\frac{1}{4}$ grain) have been used for the same purpose.

(2) The treatment of the pre-paroxysmal stage may next be considered. In cases where the attack is preceded by a well-marked *aura*, it is no doubt possible in some instances by the adoption of suitable measures, to prevent the attack. An old and familiar expedient is to tie a string round the limb in which the aura is felt, between its place of origin and the rest of the body. The application of a blister has been said to have the same effect. Cases are also on record in which the seizure has been prevented by cauterisation of the spot from which the aura proceeds, or by the application of laudanum to a tender surface aura (*Wilks*), or by extension of the leg muscles when the fit used to be preceded by jerking and flexion of the limb (*Reynolds*), or by forcible extension of the fingers when the attack followed spasmodic closure of the hand (*Bazire*). Such expedients are, however, of very uncertain efficacy. Dr. J. C. Da Costa states that in the Philadelphia Hospital it was found that a sudden electric shock was especially apt to be successful, and "almost as successful whether applied between the seat of sensation and the nerve centres or at some distant portions of the body." Both Weir Mitchell and Crichton Browne testify to the utility of inhalations of nitrite of amyl in abating an epileptic fit, if administered as soon as the deadly pallor of the face appears, or when first the warning aura is felt. Intelligent patients should be advised to carry capsules of nitrite of amyl about with them, so as to inhale deeply the contents of one as soon as the usual warning is experienced. Nitroglycerine given hypodermically has been found to have the same effect. Fits that occur with some sort of regularity, may sometimes be modified or prevented, by giving a large dose of potassium bromide a few hours before the expected attack.

(3) We must now pass on to the chief consideration in connection with the treatment of epilepsy—viz. the *treatment* in the intervals between the paroxysms; and with this we may include the preventive treatment of the disease in the predisposed.

It is held by some physicians that attacks of infantile convulsions afford an early indication of an epileptic predisposition. This is certainly not always the case, but it is possible that it may be so in children of neurotic parents. After such attacks it is a wise procedure to put these children on a mild course of bromides for three or four weeks, in order to allay the convulsive tendency. Any source of peripheral irritation must, of course, be sought out, and, if possible, removed, such as worms, phimosis, dentition, gastro-intestinal irritation, etc. As they grow up, such children require firm, but gentle, control and discipline. Out-of-door exercise and occupation should be enjoined, so that when bed-time comes the child should feel a wholesome desire for rest and sleep. Violent emotional disturbances should be especially guarded against by early training to obedience and self-restraint, and all competitive tasks should be forbidden.

All stimulating and exciting foods and drinks should be prohibited, such as coffee, tea, and alcoholic beverages. The diet should be plain and simple, containing only a small amount of animal food, but composed chiefly of farinaceous foods and milk.

An ample proportion of sleep, in a well-ventilated bed-chamber, is an excellent tonic to a feeble, nervous system; wakefulness should be especially guarded against in the neurotic child as both exhausting and exciting; sometimes a little simple food, such as a glass of milk, or a cup of bread-and-milk, at bed-time, or during the night, will enable a wakeful child to sleep. It must be remembered that digestion in quickly-developing children is often very rapid, and the need of food at short intervals is apt to be lost sight of, and a child may be wakeful on account of hunger.

The acquirement of evil sexual habits must be especially guarded against. It is advisable, if restful sleep at night cannot otherwise be secured, to give a small dose of bromide at bed-time.

The occurrence of constipation must also be prevented; and it must be insisted upon that a daily solicitation of the bowels, at a regular fixed hour, should be the invariable practice—a practice very commonly neglected by young growing girls. Instead of laxative medicines (of which a dose of Gregory's powder, or of the compound liquorice powder, is best), the regular introduction into the diet of some aperient vegetable or fruit is advisable; boiled spinach, onions, water-cresses, lettuce, oranges, bananas, and stewed figs and prunes, are all suitable. Anæmia, or signs of nerve-exhaustion, indicate the need of ferruginous tonics, with lime salts, such as the compound syrup of the hypophosphites, or the syrup of the iodide of iron. A combination of small doses of bromide and iron answers exceedingly well in some cases.

Mental tasks must be imposed with great moderation, and all competitions avoided, and exciting, emotional literature forbidden.

By the careful study and application of the foregoing suggestions we may hope, in many instances, to prevent the neurotic child from becoming an epileptic youth.

The main object of **treatment** in the **intervals** between the paroxysms is to prevent the occurrence, or diminish the frequency, of the convulsive seizure. Complete cure of epilepsy is rare, and has not been noted in more than 5 to 7 per cent. of cases.

We have anticipated much that need be said on the matter of the *hygienic* treatment of the epileptic, in what has immediately preceded. The same rules of life which we have just laid down as applicable to neurotic children, with a proneness to epilepsy, will apply with equal force to those who have actually become epileptic.

With regard to food, there is a considerable weight of evidence in favour of restricting the epileptic to a vegetarian diet and milk. A marked diminution in the frequency and the severity of the seizures has been observed to follow the limitation to purely vegetable food. After a time, if the patient wishes it, fish and eggs, in small quantities, may be permitted. The food, of whatever kind, should be always moderate in quantity, well prepared, and easy of digestion. All stimulating beverages and tobacco should be forbidden. Food just before bed-time should be avoided. The sexual passion should be kept under severe control; and in this matter the usual medicinal treatment by bromides greatly helps us, by lessening the sexual appetite.

Marriage is, of course, out of the question.

Occupation should, if possible, be found for the epileptic, but it should be free from all excitement and strain.

Regular daily exercise should be insisted on, and a regular action of the bowels should be seen to.

No *medicinal* treatment of epilepsy that has, as yet, been discovered at all equals in efficacy the alkaline **bromides.** Their beneficial effects are attributed to their influence on the cerebral cortex, diminishing greatly the excitability of the cells of the motor areas. They also diminish reflex irritability by their sedative action on the sensory tracts in the cord.

In a few cases the administration of the bromides leads to permanent cure; but, in the majority, it simply inhibits the attacks, and on the cessation of the treatment the convulsions are apt to recur. They have been found of less value in the *petit mal* than in the *grand mal*, and in nocturnal than in diurnal attacks. The bromides, in some cases, after a time, lose their protective power; and in a certain number of instances they fail to be of use at any time. A certain method should be adopted in the administration of the bromides, and especially in the adaptation of the dose to particular cases, and in the selection of the most suitable combination.

Originally the potassium bromide was the salt invariably prescribed, but of late years there has been a tendency to endeavour to replace this salt by other bromides, and especially by the sodium and ammonium bromides. The sodium bromide is, no doubt, less irritating, and much less depressing to the circulatory and muscular systems, than the potassium compound; and it is better tolerated during long periods of use; but some physicians—and notably Dujardin-Beaumetz—maintain that it exerts less control over the epileptic paroxysms than the potassium salt. The ammonium bromide, if given alone in large doses, has been found excessively irritating to the stomach. In short, most authorities are agreed that the best results are obtained from the **mixed bromides.** Some use the potassium, sodium, and ammonium bromides in equal parts; and others prefer two parts each of the potassium and sodium salts to one part of the ammonium salt. It is best to give the larger doses, which we are sometimes obliged to administer, *well diluted* with milk, which almost completely disguises the taste, or with milk and some alkaline mineral water, such as Vichy, Vals, or Apollinaris.

With regard to the appropriate dose, we must study each case and note the individual susceptibility to the medicine, and regulate the dose accordingly; some individuals will require much larger doses than others. We should remember that children are generally very tolerant of the bromides, and will often bear nearly as large doses as adults. Females usually require less than males.

The method suggested by Hare* is, perhaps, the best in ordinary cases—viz. to begin with 10 to 15 grains thrice daily, and to increase the daily dose by

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* "Epilepsy: Its Pathology and Treatment." By H. A. Hare.

10 grains every day until signs of saturation appear. In chronic cases he prescribes the drug during the first week in rapidly-increasing doses, and during the next week gives just enough to maintain the general effect. In this way the stomach has a moderate rest at regular intervals. Some give rapidly-increasing doses until anæsthesia of the palate and pharynx is induced (this may be ascertained by touching these parts with a feather), which takes usually about three weeks, and then the dose is decreased. Dujardin-Beaumetz thinks it hardly safe to trust to this sign, and considers the dose should be pushed, till the attacks disappear, even up to 5 or 6 drams a day. He estimates the average dose at 2 drams daily. Very much depends on the *purity* of the bromide, and when any disappointment occurs in the result expected this point should be looked to. If the fits are known to occur with regularity at some particular part of the day or at other stated intervals, we should give a single large dose three or four hours before the usual time of the attack and smaller doses in the intervals. In nocturnal epilepsy we should give 50 or 60 grains an hour or two before bed-time. If the attack is prone to occur after getting up in the morning, we should give 30 or 40 grains at bed-time and repeat this dose on first waking in the morning. When the bromides are being taken regularly twice or thrice daily, it is best to give them about an hour after food, in order to avoid their occasional irritative effect on the gastric mucous membrane; but when we are giving single doses with the view of producing an immediate and decided effect it is best to give it when the stomach is empty, so that it may be quickly absorbed unmixed with food. The elimination of bromides has been said by Rabuteau* to be slow, and he has detected potassium bromide in the urine a month after its administration; but the contrary is stated in Dujardin-Beaumetz's work,† and it is there maintained that it begins to be eliminated by

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* Hare's "System of Therapeutics," vol. iii. p. 241.

† "Clinique Thérapeutique," vol. iii. p. 202, note (2).

the kidneys ten minutes after it has been taken into the stomach and that its elimination is almost complete at the end of twenty-four hours.

In the administration of the bromides in epilepsy, while it is necessary not to stop short of giving the quantity needed to produce the effect desired, it is also important to be on our guard against what has been justly termed its "ignorant and excessive use." It is well known that when saturation of the system has been reached, if the doses are not diminished, the most unpleasant symptoms of **bromism** appear, "often sufficiently serious to cause death." *

The following are the symptoms which may be observed when this state of bromism has been induced:—The complexion is dark and muddy, the skin cold and clammy and covered with acne, there is complete anæsthesia of palate and pharynx, the action of the heart is feeble and hurried, there is great impairment of memory, dilated pupils, hesitating speech, mental confusion and torpor, loss of sexual power, great drowsiness, unsteadiness of gait, and, together with these symptoms, bronchial and gastric catarrh with fœtor of the breath may appear. A state of dementia is sometimes induced. The signs of the development of bromism during the prolonged use of the bromides should be looked for, and when they appear the medicine should be stopped or the doses greatly diminished. We must not, however, regard the appearance of acne alone as a sign of saturation; this disquieting and disfiguring eruption will often occur after quite moderate doses in certain individuals; it is best avoided by giving the drug largely diluted in some alkaline water, and by combining with it full doses of Fowler's solution from time to time.

The next question for consideration is, how long is it desirable that the use of bromides should be continued after the convulsive attacks have ceased to recur? Certainly for two or three years. A method that has been found to answer well is the following:—After a year of freedom from attacks, give the bromides only six days in the week, after fifteen months, only five days in the week (two days of rest), after eighteen months, only four days in the week (three days of rest), and at the end of two years only three days in the week (four days of rest).* Cases in which we must not expect much good to result from the bromide treatment are those dependent on inherited tuberculosis, those dependent on injuries or deformities of the skull, those caused by dentition, those due to syphilis (and requiring specific treatment); while cases difficult to influence favourably are those excited by menstruation, those accompanying mental disturbances, and those which are traceable to alcoholism in the parents. Masturbation provokes a return of the seizures and interferes greatly with the good effect of the bromides. It is a good plan, as suggested by Osler, for the nurse or attendant, or a near relative of the patient, to keep a book in which the number and period of the attacks are recorded, as well as the quantities of the bromides given.

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* Dujardin-Beaumetz.

Many other bromides have been used in the treatment of epilepsy besides those alkaline bromides we have been considering.

Lithium bromide has been found very useful in obstinate cases; it is given in doses of 5 to 15 grains.

Strontium bromide has been commended by Dr. Constantin Paul, who has seen it succeed after potassium bromide has failed. It is said also to be better tolerated than the latter: the dose is 10 to 30 grains.

Calcium bromide has also been used in 15- to 30-grain doses in solution in water, and has been found less depressing than potassium bromide.

Nickel bromide has been found by Dr. Hare to be practically identical in its action with potassium bromide, and it has proved curative in a few cases in which the potassium salt had failed.

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* Legrand du Saulle, "Traitement et Curabilité de l'Epilepsie."

Bromide of *gold* has been given in ¼-grain doses in aqueous solution (must be kept in the dark), and it has been thought to do good.

Bromide of *arsenic* has been advocated in the epilepsy of idiots.

Bromide of *zinc* has been recommended by Hammond, in doses of 2 to 8 grains in water, well diluted; the larger doses are apt to prove emetic; it is said, however, not to cause bromism.

Monobromate of camphor has been given in doses of 5 grains three times a day, and slowly increased to 10, 15, and even 20 grains. It is best administered in *perles* of 2 grains each. It has been found of use in cases attended with much sexual excitement, otherwise it seems of little value in epilepsy.

The bromide of *iron* is a good addition to the alkaline bromides to relieve anæmic states and to check the tendency to bromism, 20 to 30 minims of the syrup may be added to each dose of the other bromides. The value of hydrobromic acid in epilepsy has, we consider, been greatly overrated.

The bromhydrate of *conine* in ¼- to ½-grain doses has been given in cases where other bromides caused bromism, and is said to have considerably diminished the frequency and violence of the seizures.

Although the bromides undoubtedly exercise a greater curative and palliative influence over this disease than any other drugs, yet it not unfrequently happens that their use fails to be attended with the benefit expected, or they disagree with the patient to such an extent as to preclude their continued employment; in those circumstances we must consider what other medicinal agents we may advantageously use in their stead.

Borax has recently been put forward as a valuable remedy in the treatment of epilepsy, and as having a special influence in preventing the *nocturnal* attacks. Some have used it in combination with potassium bromide, obviously a most fallacious method for determining its real value. It has been found of use in a certain proportion of cases, and a trial of the remedy would appear to be indicated in those individuals who cannot tolerate the bromides, and in those instances in which they fail to produce any remedial effect. It is given in 10-grain doses at first, increased up to 80 or 90 grains daily, mixed with a little glycerine, syrup and water. A great drawback to its employment is that it is apt to produce much gastric disturbance, nausea, vomiting, sore mouth and lips, as well as psoriasis and eczema. The vomiting may be prevented by giving a little cocaine a quarter of an hour before the borax.

Boric acid in 5- to 20-grain doses has been used instead of borax.

Belladonna, ever since its warm advocacy by Trousseau, for the treatment of epilepsy, has always been thought worthy of trial. He used to give it in small doses at first, a fifth of a grain of the powder and of the extract, in a pill, night and morning, for the first month, and every month an additional pill was added until the dose reached twenty pills twice a day.

It has been found by Fagge and Reynolds to diminish the frequency of attacks, and it seems to be of most value in the *petit mal*, and in the prevention of nocturnal seizures. In such cases it may be advantageously combined with bromides.

Zinc compounds, and especially the *oxide*, have been found of value in epilepsy. Reynolds and Wilks testify to this effect. The oxide is given in 5-grain doses thrice daily. The citrate and the lactate are, however, preferred by many as less likely to cause stomach derangement, the dose of the former in 3 to 12, and of the latter 5 to 30 grains twice or thrice daily.

The ammonio-sulphate of copper and the oxide and nitrate of silver scarcely appear to have merited the confidence once placed in them; they are scarcely ever used now. The continued use of nitrate of silver has the very undesirable effect of conferring a permanent bluish staining to the skin.

Digitalis is said by J. C. Da Costa* to be a valuable remedy in *petit mal* and in nocturnal epilepsy. Da Costa thinks it produces sleep in the latter case by raising the depressed vascular tone. He and Huchard regard it as a valuable addition to the bromides when there is cardiac weakness.

Cannabis indica has its advocates, and is said to resemble the bromides in its action. It may be given in ½-grain doses of the extract, or 10- to 20-minim doses of the tincture.

Chloral is a valuable auxiliary remedy in the management of certain troublesome cases of epilepsy with a tendency to insomnia, violent convulsions, or maniacal excitement. It is of value by exercising a calming effect on the disturbed motor cerebral centres, and on the motor tracts in the cord, and by inducing sleep it allays mental excitement. It is best to reserve its employment till the evening, and not give it during the day, and it acts best when combined with bromides. In cases of cardiac debility it must of course be used with great caution.

The *nitrites*, sodium nitrite, nitro-glycerine, and nitrite of amyl, have been of late years largely used in the treatment of epilepsy. They are all worthy of trial, especially in cases of *petit mal*, but their effects are too evanescent to enable them to be of much use in the graver forms. One drop of the 1 per cent. solution of nitro-glycerine or a grain of sodium nitrite may be given three times a day, or five to thirty drops daily of the mixture recommended by Hammond of one part nitrite of amyl and six parts alcohol.

Sulphonal has been used by Weir Mitchell to control epileptic attacks.

Antipyrin and *acetanilide*, two drugs for which Dujardin-Beaumetz has always a remarkable partiality, have been recommended by him as of great value in those cases of epilepsy in which the bromides have failed to exercise any remedial effect. He declares he has obtained definite cures by the use of acetanilide in four such cases. He gives $7\frac{1}{2}$ grains in cachets three times a day. Judging from the trials of this drug by other physicians it would appear to be of very uncertain action. But *antipyrin*, when given combined with ammonium bromide, seems to be a real gain in the practical management of epileptic cases, Prof. H. C. Wood's recommendation of this combination (antipyrin, 6 grains, ammonium bromide, 20 grains) has been corroborated by many other competent observers. Its use was unattended by bromism or any unpleasant symptom. It seems to have had the power of alleviating some quite hopeless cases.

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* Hare's "System of Practical Therapeutics," vol. iii. p. 241.

Many other drugs have been put forward as of use in the treatment of epilepsy, but we have not thought it desirable to add further to the already long list of uncertain remedies.

When the epileptic attacks are associated with any obvious constitutional vice or defect of nutrition, medicines directed to the relief of the latter, in combination with those more immediately directed to the prevention of the seizures, are clearly indicated. When there is any suspicion of syphilis, large doses of potassium iodide, 10 grains three times a day, gradually increased, must be combined with a mild bromide treatment, and mercurial inunctions if necessary. In feeble, ill-nourished strumous cases cod-liver oil should be prescribed; and, as we have already said, in anæmic cases small doses of iron are indicated. Even strychnine has been found useful by Bartholow in anæmic subjects with signs of much nervous exhaustion and debility; its use, however, is chiefly appropriate in cases of *petit mal.*

A seton introduced into the nape of the neck, blisters, and the actual cautery applied in the same situation, and the application of croton oil to the scalp, are rather expedients of the past than of the present. Electricity in various forms and modes of application has had many trials, but never with any striking results. Hypnotism and suggestion have been advocated, and it is not unlikely that in the hysterical forms they may meet with some success.

There are certain complications of epilepsy, the management of which we may here briefly notice. *Prolonged* **coma** following an epileptic attack may require the application of an ice-bag to the head, or a blister to the nape of the neck, or the withdrawal of a few ounces of blood if there is evidence of cerebral congestion. On the other hand, high arterial tension with a probability of great cerebral anæmia would indicate the hypodermic injection of nitro-glycerine.

The **status epilepticus,** in which the convulsion passes into coma, and coma into renewed convulsion, without any recovery of consciousness, is often observed in asylums for the insane. It is a very serious condition, the mortality attending it being as great as 50 per cent., and active treatment is necessary to prevent a fatal result. *Chloral* given by the rectum, 30 to 60 grains every hour, is a common expedient; some inject it hypodermically to the extent of 30 or 40 grains. This succeeds in some cases, but also often fails. It is advisable, at the same time, to give stimulating enemata to prevent too great cardiac depression.

Inhalations of *ether* and *chloroform* may be given for the immediate arrest of the convulsions, and to prevent exhaustion until other remedies act. *Amyl nitrite* has been warmly advocated by some, and found useless by others. The same may be said of large doses of potassium bromide.

Hypodermic injections of *sulphate of morphine* ($\frac{1}{3}$ grain) and *sulphate of atropine* ($\frac{1}{100}$ grain) have occasionally been found useful.

Hyoscine hydrobromate, $\frac{1}{100}$ to $\frac{1}{80}$ grain, hypodermically, if great cardiac asthenia does not counterindicate its use, has been found very efficacious in arresting convulsions and in inducing sleep.

A combination of *hydrobromate of conine* ($\frac{1}{100}$ to $\frac{1}{40}$ grain) with sulphate of morphine has been greatly praised for its efficacy in stopping the convulsions and bringing on a prolonged sleep.

The patient's strength must be maintained and the cardiac action supported by injection into the stomach, through the nasal tube and funnel, of eggs, milk, stimulants and quinine; and hypodermic injections of small doses of atropine and digitaline.

Epileptic mania and *epileptic dementia* require asylum treatment.

Finally, we have to consider the question of the **surgical treatment** of epilepsy.

This is a somewhat difficult one to deal with. There is an eagerness and enthusiasm about the adoption of operative measures for the relief of otherwise incurable disease of the nervous system, at the present time, which we should be very sorry to oppose, but which we are far from believing will be permanent. And with regard to the relief afforded by operation in epileptic cases, we have the remarkable testimony of Professor J. W. White in his able paper on "The Supposed Curative Effect of Operations, *per se*," in which he shows conclusively that the mere performance of an operation is *of itself* sufficient to produce, at any rate for a time, great relief. He refers to ninety cases of trephining in which nothing abnormal was found, yet great amelioration followed the operations, and two cases were apparently cured. There is also the remarkable case reported by Briggs, in which there was a depressed fracture of the skull and also necrosis of the tibia. The cure of the necrosis stopped the epileptic attacks.* Gowers also remarks that making a hole in the skull, just like the introduction of a seton in the neck, may be looked upon as an energetic form of counter-irritation, and may yield beneficial results for a time. Seeing that good results may possibly follow the performance of an operation of any kind, there can be no reason for discountenancing operations that are in themselves free from danger; but when operations attended with serious risk are proposed, it behoves us to be cautious and reserved in sanctioning them.

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* Hare's "System of Practical Therapeutics," vol. iii. p. 248.

There are, however, cases of epilepsy directly referrible to some injury to the skull, in which no hesitation need be felt in counselling operation. If there is an external scar which is tender, and especially if an *aura* starts from the scar, the effect of removing the scar should be tried before trephining, especially if no depression or injury of the skull is discoverable. But if the injury is situated over a known centre, and the convulsions are limited to the group of muscles corresponding to that centre, the skull should be trephined and that centre removed.

But it is in the non-traumatic cases, the cases which Horsley has termed "focal epilepsies," that some difference of opinion exists as to the propriety of operation. Gowers holds that if the fits are local and partial, and if there is good ground for thinking there is disease that can be completely removed, then operation is justifiable; but if the convulsions are widely diffused, and extend to the other side of the body, the probability of benefit is too small to justify the very considerable risks of the operation. He considers that even if the primary lesion be removed the stability of nerve cells has been so disturbed that discharges will start from other cells. "Operation," he says, "should never be thought of in a case of idiopathic epilepsy in which the fits begin locally, because it is certain that the discharging tendency is widespread, and almost certainly adequate, in other parts, to cause fits." Horsley considers operation justifiable in all cases "where an initial spasm of one segment or part of the body can be detected," and he advises the following procedure: "The correct examination of the case, the observation of the attacks by trained nurses and attendants," so that the seat of the epileptogenous disturbance may be positively ascertained. After a few months' trial of bromides, douches, etc., the exploration of this spot should be undertaken. "If no gross lesion is observable when the cortex is exposed, it should be stimulated with the induced current. Careful observation will soon show movement of each segment. The locality giving rise to the initial spasm should then be excised."* The subject, we conclude, is not yet ripe for decision or final judgment.

ADDITIONAL FORMULÆ.

Prescription for the mixed bromides.

℞ Ammonii bromidi, 2½ drams.
Sodii bromidi, 2½ drams.
Potassii bromidi, 2½ drams.
Aquæ ad 8 oz.

M. f. mist. One to two tablespoonfuls for a dose. (*Dujardin-Beaumetz.*)

Combination of bromides and iodides.

℞ Sodii bromidi, 3 drams.
Potassii bromidi, 3 drams.
Ammonii bromidi, 3 drams.
Potassii iodidi, 1½ dram.
Ammonii iodidi, 1½ dram.
Ammonii carbonatis, 1 dram.
Tinct. calumbæ, 1½ oz.
Aquæ ad 8 oz.

M. f. mist. A teaspoonful, in water, before each meal and at bed-time. (*Brown-Sequard.*)

Combination of bromide and atropine.

℞ Potassii bromidi, 15 grains.
Atropinæ sulph., $\frac{1}{60}$ grain.
Aquæ ad 1 oz.

M. f. haust. To be taken three times a day. (*Landell.*)

Combination of bromide with intestinal antiseptic (to avoid unpleasant symptoms of bromism).

℞ Potassii bromidi, 1½ dram.
β-naphthol, 1 dram.
Sodii salicyl., ½ dram.

M. et divide in doses 3. A dose three times a day. (*Féré.*)

Atropine and hyoscyamine pills.

℞ Atropinæ sulphatis, ¾ grain.
Hyoscyamine, ⅓ grain.
Pulv. et extr. glycyrr., q.s.

Ut f. pil. 60. One night and morning. (*Benedikt.*)

For epilepsy with cardiac irregularity.

℞ Zinci valerianatis, 3 grains.
Extr. belladonnæ, ⅓ grain.
Pulv. digitalis, ¼ grain.

M. f. pil. A pill three times a day. (*Da Costa.*)

Combination of anti-epileptic remedies.

℞ Strychninæ sulph., 1 grain.
Extr. ergotæ fluid., 1½ oz.
Liq. arsenicalis, 2 drams.
Sodii bromidi, 1½ oz.
Tinct. digitalis, 3 drams.
Aquæ menthæ pip. ad 4 oz.

M. f. mist. A teaspoonful in half a tumblerful of water before food. (*Hamilton.*)

Combination of antipyrin and ammonium bromide.

℞ Antipyrin, 2 to 4 drams.
Ammonii bromidi, 4 to 8 drs.
Aquæ cinnam. ad 3 oz.

M. f. mist. A teaspoonful three times a day. (*Potts.*)

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* *British Medical Journal*, Dec. 6, 1890.

To diminish severity and frequency of convulsions.

℞ Morphinæ sulph., 1½ grain.
Tinct. veratri virid., ½ oz.
Aquæ, ½ oz.

M. Twenty minims hypodermically during or before a convulsion. (*Mordough.*)

For epileptic attacks following suppression of menses.

℞ Extr. nucis vomicæ, 10 grs.
Pil. aloes et myrrhæ, 2 drams.

M. et divide in pil. 36. One or two twice a day. (*Copland.*)

Borax mixture for epilepsy.

℞ Boracis, 3 drams.
Glycerini, 1 oz.
Aquæ ad 3 oz.

M. f. mist. (Dissolve the borax in *warm* glycerine.) A dessertspoonful three times a day. (*Finlay.*)

Stramonium and hydrobromic acid in epilepsy.

℞ Extracti stramonii fluid. (U.S.P.), 160 min.
Acid. hydrobromici dil., 1 oz.
Syrupi, 1 oz.

M. Begin with half a teaspoonful doses and continue until physiological effects of stramonium appear.
(*W. C. Wade.*)

CHAPTER VII.

THE TREATMENT OF HYSTERIA AND NEURASTHENIA.

HYSTERIA—Symptoms (1) of Convulsive Forms; (2) of Non-convulsive Forms—Paralyses—Contractures, etc.—Hyperæsthesia—Anæsthesia—Neuralgia, etc.—Causation—Educational Influences, etc.—*Treatment* (1) of the *Hysterical State*—Hygienic—Medical Treatment should be directed to the Relief of Disordered Functions—Antispasmodics—Bromides: Indications and Counter-indications for their Use—Morphine—Chloral—Hydrotherapy—Sea-bathing—Hypnotism—(2) of the *Convulsive Attacks*—(3) of *Particular Symptoms*—Contractures—Paralysis—Aphonia—Hysterical Joints.

NEURASTHENIA—Symptoms—The "Rest Cure"—Indications and Counter-indications—*Anorexia Nervosa*—Methods of Applying the "Rest Cure"—Isolation—Diet—Massage—Electricity—Tonics—Schedule. Additional Formulæ.

HYSTERIA.

THE vast number of morbid phenomena which it is possible to gather together under the common designation **hysteria,** renders any attempt at a comprehensive, yet concise, account of its nature, causes, and treatment, a task of some difficulty. As, however, the therapeutic side of the question is now our chief concern, we must not be expected to enter into elaborate details of the various functional disturbances, mental and physical, which a full consideration of this disease would necessitate. Since the commencement of the remarkable and minute observations of Charcot and his followers, in the study of the hysterical state, and especially of those forms of hysteria grouped by Charcot under the title of *grande hystérie*, or hystero-epilepsy, the literature of this branch of practical medicine has been enriched by a mass of voluminous contributions, the barest abstract of which would occupy very many pages.*

We must, however, in this place, confine ourselves to the consideration of those definite symptoms, and manifestations, which call for equally definite remedial measures, as well as of the *general* morbid condition out of which they spring.

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* An excellent brief abstract of this subject will be found in Osler's "Practice of Medicine," art. "Hysteria."

We may conveniently divide those symptoms into (1) those of the *convulsive* forms and (2) those of the *non-convulsive* forms.

(1) The **convulsive** forms include that common manifestation of hysteria—the hysterical "*fit.*" Often after some unusual emotional disturbance attended with laughing or crying, and accompanied by a very characteristic symptom, the "*globus hystericus,*" *i.e.* the feeling of a ball rising into the throat and causing a choking sensation, the patient becomes attacked with more or less violent convulsions and *apparent* unconsciousness. The convulsive movements are clonic and irregular, and usually subside quickly. They are often succeeded by emotional manifestations, by abdominal distension, and by the passage of a large quantity of clear urine. Attacks of this kind assume all degrees of severity and duration, and may be followed by great mental and physical exhaustion.

The graver forms, the *grande hystérie*, or hystero-epilepsy, of Charcot, are comparatively rarely seen in England, and would seem to be almost restricted to the Latin races. The most varied symptoms and manifestations, especially the occurrence of convulsive attacks closely resembling epilepsy, have been observed and recorded in these forms, which we have not space to detail here.

(2) In the **non-convulsive** forms we again encounter an immense variety of morbid phenomena. We can only refer to the chief of these.

One of the most striking is the occurrence of local **paralyses.** "There is no type or form of organic paralysis which may not be simulated by hysteria" (*Osler*). Paraplegia is more common than hemiplegia. Aphonia from paralysis of the laryngeal muscles is a common form. Paralysis of the bladder is a frequent accompaniment of hysterical paraplegia.

Contractures, affecting certain groups of muscles, and causing lameness and deformities, have been especially studied and described by Charcot.

Clonic and *rhythmic* spasms, leading to odd rhythmic rotatory, bending, or other movements, are not rare.

Tremors, with, or without paralysis, and contractures, may also be partly hysterical.

Disturbances of sensation are also common.

Anæsthesia, and particularly *hemi-anæsthesia,* has been often noted. The transference of loss of sensibility, from one side of the body to the other, upon the application of certain metals—which, under the name of metallotherapy, was, at one time, much discussed—has proved to be capable of other explanations. *Hyperæsthetic* and *neuralgic* states are very frequent in hysteria. Increased sensitiveness in the ovarian regions and pain in the back are almost general. Gastralgia and enteralgia are often hysterical. Morbid affections of the special senses, and especially retinal hyperæsthesia, are common.

Hysterical dyspnœa, cough, hiccough, and even hemiplegia, are occasionally met with. Vomiting, aggravated flatulence, loss of appetite (the extreme form of this, named by Sir William Gull *anorexia nervosa,* we shall consider under neurasthenic states), obstinate constipation, palpitations, pseudo-angina, flushings, and sweatings, are also frequently manifestations of hysteria. *Hysterical affections* of the *joints,* especially of the knee and hip, have long been recognised and described by surgeons.

Mental and *moral* perversions, often of the most serious nature, form, perhaps, the most distressing features of the hysterical state.

The occurrence of pyrexia and hyperpyrexia in hysteria requires further elucidation.

It has been forcibly and truly said by Dujardin-Beaumetz that "hysteria, by its strange manifestations, has suppressed the word '*impossible*' from pathology"!

Such, then, being a brief outline of the various manifestations of hysteria; what, we may ask, do we know of its **causation**, and does that knowledge afford us any indications for its prevention and cure?

Although cases of hysteria are occasionally observed in the male, it is undoubted that the female sex is a strong predisposing cause; the old idea, however, that it was entirely referrible to uterine disorder is no longer tenable.

The age of puberty is another predisposing cause; and we may often have the opportunity of watching the wayward, emotional, uncontrollable child pass at puberty into the hysterical woman; and this and other observations give a basis for the belief that, in a considerable number of cases, sexual disturbances and morbid states of the generative organs have a causal influence. Masturbation and sexual excesses are undoubtedly exciting causes; and ovarian hyperæsthesia has been noted by Charcot and others in almost all the serious forms.

Race certainly appears to have great influence in the production of the severer forms; and the study of hystero-epilepsy, or *grande hystérie*, could scarcely have been carried out in England for lack of material. The more emotional and sensitive Latin races contribute chiefly to this form of the malady.

Faulty educational methods have been justly believed to have much to do in developing and fostering the tendency to hysteria, and this is especially likely to be the case in the offspring of neuropathic parents. The encouragement, by undue indulgence, of personal vanity, self-consciousness, and want of self-control, in children of emotional or neurotic temperament is undoubtedly a fruitful cause of hysteria in later life. The frequent absence of any proper attention to the *physical* education of young girls, to the development of their muscular system, by suitable gymnastics and out-of-door exercises, their too close confinement to school studies in some cases, their precocious introduction to exciting and erotic literature in others, are evils tending in the same direction.

The comparatively infrequent occurrence of the graver forms of hysteria amongst country-bred girls who have been early habituated to out-of-door exercises, to cold bathing, and to wholesome habits, mental and physical, indicates clearly enough the direction that should be taken in the application of preventive measures. Home education for girls is thought by some to exercise a predisposing tendency to this disease, and so, doubtless, it does when the parents are weak and indulgent, or the mother has herself shown tendencies to hysterical manifestations; the influence of example having a powerful predisposing effect. But when home influences are good we consider it the best place for a girl's education.

Anæmic conditions and defective nutrition appear to act, in some instances, as predisposing causes; but these are states which predispose to nearly every form of disease, and which always demand remedial treatment. Hysteria, however, may often be seen to occur in the robust and plethoric, and in such cases we should look to menstrual disturbances, or conscious or unconscious sexual excitement, as frequently at the root of the attacks.

Emotional shock and mental and physical strain, such as disappointment in love, domestic unhappiness, loss of social position, anxious nursing, grief, fright, etc., are amongst the commonest exciting causes of hysteria.

Finally, attacks of hysteria sometimes follow acute illnesses, accidents, and injuries; and the existence of actual disease of the generative organs often leads to hysterical manifestations.

In approaching the consideration of the **treatment** of hysteria we must bear in mind what Dujardin-Beaumetz has so well expressed, viz. that "hysteria, by its very nature, escapes all precise and scientific therapeutic inductions, and for *two* reasons: *Firstly*, from the preponderating part which the imagination plays in this loss of balance of the nervous functions, so that there, where the learned, conscientious, patient and devoted physician will fail, the most barefaced charlatan will easily succeed—hysteria being, in fact, the nursery of surprises and miracles; and *secondly*, because the hysterical patient loves to *deceive* those around her. . . . In short, in this neurosis everything may fail and everything may succeed." * The malady, in its origin, is essentially mental and emotional, and *moral control*, therefore, must enter largely into its successful management.

It will be convenient to consider:

(1) The general treatment of the hysterical state;
(2) The treatment of the convulsive attacks; and
(3) The treatment of particular symptoms.

(1) Harsh treatment should never be adopted or encouraged; make the patient see that you thoroughly understand her condition, and that the remedies you propose will be carried out firmly but kindly. Demand absolute trust and confidence from her friends, and failing to obtain this, assure them that your services are useless.

In considering, first, the **hygienic** management of such cases we have already alluded to the need of educational precautions in the training of children with neurotic tendencies. We have referred to the importance of free exercise in the open air, riding, boating, swimming, and of suitable gymnastic training of the muscular system. All that appeals strongly to the emotional element should be avoided; intellectual tasks should be light and school hours short, imaginative literature should be put in the background, and interesting historical, biographical and descriptive works should take its place. Some physicians object to the study of the piano, and especially of the organ, and we have ourselves seen numerous instances in which the cultivation of music has seemed to excite the sensuous emotions and to foster hysterical tendencies. Dujardin-Beaumetz sees a special danger in the study of the organ, and states that he has seen much hysterical excitement provoked by it, a result to be attributed, he thinks, "not only to the penetrating harmony of its sounds, but also to the movements of the lower limbs in working the pedals of the instrument." What is termed the "religious education" of such children should be approached with great caution and reserve, lest the foundation be laid of future religious ecstasy, mysticism, or melancholia, which often forms so troublesome a part of the mental manifestations of hysteria.

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* "Clinique Thérapeutique," vol. iii. p. 141.

The **diet** should be simple, abundant, and supplied regularly, and at not too long intervals, as is frequently the case in boarding-schools. All strong stimulants are best avoided, and the hysterical should not indulge in tea, coffee, or exciting wines and liqueurs. In some anæmic cases a little sound, red wine with water may be of use as a tonic.

In arranging the mode of life of young persons predisposed to hysteria, we should remember that some form of distraction or congenial occupation is necessary, and while the excitement of an excess of social gaiety is harmful, the *ennui* and vacancy of a dull, unoccupied life are very prone to give rise to hysterical manifestation, favouring, as they do, injurious habits of introspection and self-consciousness.

It is necessary to watch carefully the occurrence of the menstrual periods, which greatly predispose to hysterical attacks. That unsatisfied sexual desire often unconsciously provokes these attacks, especially in the robust and plethoric, cannot, we think, be doubted, and it is in such instances that our advice as to the propriety of marriage is sometimes sought. When there is nothing in the antecedents of the patient inconsistent with a future of good health, and when other circumstances are not unfavourable, we should not exceed our duty in pointing out to parents, that they often act injudiciously in opposing or postponing unions which, from the point of view of health, it would be wiser to permit; on the other hand, there are cases in which to counsel marriage would be, as has been well pointed out, to condemn a man to a life of trouble and misery in order to procure a benefit which is altogether problematical.

In passing on to the examination of the **medicinal** treatment of hysteria, we must state at the outset that we regard drugs simply as useful auxiliaries in the management of certain phases, and in the control and relief of certain symptoms and complications, but as in no sense directly curative of this malady. For example, preparations of iron may be valuable in removing co-existing anæmia, aperient medicines are often indispensable to relieve the very troublesome constipation which is so common an accompaniment of hysterical states, and so provocative to their continuance unless duly attended to, and astringent vaginal injections may be needed to arrest leucorrhœal discharges. Similarly all disorders of function must be sought out and relieved by appropriate *treatment*, for just as we see in epilepsy the removal of carious teeth may lead to the cessation of epileptiform seizures, so the appropriate treatment of some local uterine or other malady will frequently be attended by great alleviation, or even entire removal of hysterical states.

It was at one time the practice to use a variety of so-called antispasmodics, such as musk, asafœtida, galbanum, valerian, castor, etc., for the relief of hysteria. These have mostly gone out of fashion. Valerian, however, is undoubtedly useful in controlling some of the minor hysterical manifestations, and the valerianate of zinc is really a valuable remedy especially in those forms of hysteria with hypochondriacal tendencies.

One or two grains of this salt should be given in a coated pill (to cover the unpleasant odour) after food three times a day, and in hysteria in the male, a state almost always attended with despondency and signs of nervous exhaustion, the addition of $\frac{1}{60}$ of a grain of phosphorus to each pill often acts extremely well.

Fagge states that he has found these valerianate of zinc pills "most effective in removing aphonia, hemianæsthesia, and hysterical hemiplegia." Asafœtida has also been commended by Fagge and others in doses of 5 grains every three or four hours.

Considerable difference of opinion exists amongst different authorities as to the value of the bromides in hysteria. French physicians, who have undoubtedly to treat many more of the severer forms of hysteria than English physicians, rely greatly on the bromides, whereas some of the latter regard them as of little use. We are ourselves convinced that they are of great value in the detailed management of hysterical cases, although we are not disposed to regard them as directly curative; and while they are, we think, distinctly indicated in certain cases, they are as clearly counter-indicated in others.

They are counter-indicated in those cases that are associated with great physical and mental depression, in those lachrymose cases dependent on troubles, worries, and anxieties, and quite independent of any sexual excitement. But even in such cases an occasional dose of sodium bromide with aromatic spirit of ammonia and chloroform water at night to relieve sleeplessness often has a very beneficial general effect.

They are indicated, and are of the greatest possible use, in the stronger and more robust patients, with much nervous agitation and sleeplessness, and with distinct evidence of sexual excitement.

Their sedative effect on the cerebro-spinal nervous system and their specially anaphrodisiac action render them most valuable calmative agents.

The mixed bromides as recommended by Charcot act best—and a dose of 20 to 30 grains may be given in a tablespoonful of chloroform water night and morning, or the night dose only may suffice.

The bromides should not be given in large doses, nor continuously; they are most useful at the menstrual periods. Dujardin-Beaumetz recommends fifteen days of treatment and fifteen days of rest from treatment. Given in this way, and in appropriate cases, we have no doubt whatever of their great value.

Some physicians, who are not favourable to the use of bromides, have advocated the administration of opium, morphine, and chloral. Of the power of those drugs to quiet and calm the nervous symptoms, and to produce sleep, no one can have any doubt; but the remarkable soothing effect of opium or morphine brings with it a most dangerous craving for the drug. The hysterical, emotional patient's dread is not so much one of pain or of physical discomfort, as of *ennui* and weariness, and for this they find in morphine an effectual remedy; while the certainty of getting sleep from chloral, if they take it in large enough doses, brings with it also a craving for that drug.

We do not say that morphine or chloral may not occasionally be given with advantage in hysterical cases, but their administration should be reserved to the medical attendant himself, and not entrusted to the patient's friends.

It is important to be aware of the fact that hysterical patients present extraordinary differences in their sensitiveness to the actions of medicines; some are remarkably affected by quite small doses, and others require enormous doses in order to produce any decided effect. They may be said to be subject to therapeutic as well as to cutaneous hyperæsthesia and anæsthesia.

From *medicinal* we pass to the consideration of other methods of treatment, no doubt of greater curative value. **Hydrotherapy,** the systematic application of baths and douches to the treatment of hysterical conditions, has been attended with considerable success.

The use of prolonged hot baths, with some aromatic plants infused in the bath, such as valerian and the blossom of the lime-tree, has proved of great service in allaying the states of nervous excitement of hysterical patients. The patient should remain in the bath, which should be maintained at a uniform temperature, for one or two hours at a time. The inhalation of the odorous emanations from these aromatic substances is believed to increase the soothing effect of the prolonged immersion.

The application of douches has also been found of the greatest value in the treatment of hysteria, having, when fitly applied, not only a soothing, but also a distinctly bracing and tonic effect on the debilitated nervous system. The douches should be in the form of *spray*, and they should *never* be given *cold*, but *always warm* or tepid (80° to 85° F.), at the commencement of the treatment. After a time, alternating douches, warm and cold by turns, may be given; but it is necessary to note carefully the effect on the patient, so as never to give rise to too great excitement. The douche must be given so as to avoid the patient's head, and should never last more than thirty seconds. This treatment is best carried out in establishments adapted to the purpose, such as those at Matlock, Bath, Ilkley, Malvern, and Tunbridge Wells, in England; at Passy, close to Paris; at Champel, or Divonne, near Geneva; at Aussee, in Styria; at Gerardmer, in the Vosges; and in numerous other attractive localities. Treatment in these institutions has the further advantage of removing patients from their habitual *entourage*, often from moral influences not conducive to their cure.

Sea-bathing has been advocated by some English physicians, but it is protested against strongly by Dujardin-Beaumetz. He states that he has always seen sea-air and sea-baths set up a great amount of excitement, and aggravate notably the nervous sufferings of hysterical patients. We should certainly hesitate to recommend sea-bathing in well-developed hysterical states; but we should hardly be disposed to prohibit it in the case of young girls with simply a hysterical predisposition, who are fond of swimming and sea-bathing. No doubt the friends of such young persons should be cautioned against the possibility of sea-bathing causing nervous excitement, and it should be at once discontinued on any signs of this appearing.

Of the value of **electricity** and **massage** in the cure of some forms of hysteria there can be no doubt, but we shall, for the moment, reserve what we have to say on these points until we pass in review, at the end of this chapter, the application of the "rest-cure" to cases of neurasthenia.

To the application of **hypnotism** and **suggestion** to the treatment of hysteria, we must own we look with little sympathy and less confidence. That it may produce apparently remarkable results, in many hysterical cases, is only what we should expect from the very nature of the disease. That it may replace one phase of deception, conscious or unconscious, by another is probable; but we are disposed to regard the practice of hypnotism as tending to develop rather than repress, abnormal and morbid nervous manifestations.

(2) In the next place, we pass on to consider the **treatment** of the **convulsive attacks.** In the slighter attacks no active treatment is needed. It is only necessary to loosen any tight garments, and to place the patient on a bed or couch, and leave her *quite alone;* or she may be, when it can be done conveniently, watched without her knowledge; but of this we should be *quite sure.* Left alone, without notice or sympathy, the hysterical convulsions will soon come to an end. Free affusion with cold water is a tried remedy, and the mere mention of it will often suffice to bring the patient round. It may be dashed against the face, again and again; or the patient's head and shoulders may be brought over the edge of the bed, and cold water poured over them from a height. Another method, suggested by Dr. Hare, is to prevent the patient from breathing for a time by compressing the mouth and nose. She will soon make efforts to relieve herself from this restraint,

and the strong and deep inspiration she will then make is often followed by relaxation of the spasms and the cessation of the fit. The application of strong ammonia to the nose (not, however, without care, else great irritation may be provoked). is a very useful measure, as it may often be relied upon to distinguish between epileptic and hysterical convulsions.

The threat of the application of the *actual cautery* and preparation for that operation, has been said by Whitla to promptly lead to a restoration of calm and consciousness.

In the treatment of the more severe and intractable forms, Charcot introduced the method of applying *compression to the ovary*, or rather, we should say, in the ovarian or iliac region, because it does not appear to be necessary that the pressure should be made precisely over an ovary. The closed fist should be pressed firmly and strongly into the iliac fossa, and the compression maintained for a certain time. It is remarkable that pressure over this region is capable both of exciting and arresting the convulsive attack.

The application of the continuous *electric* current will often diminish the duration or cut short these convulsive attacks. One pole is placed on the forehead and the other on the epigastrium, or some other part of the body. A sudden change in the direction of the poles is, according to Dujardin-Beaumetz, particularly efficacious in arresting the attack. The current must not be very strong, 6 to 8 or 10 milliampères being sufficient.

The inhalation of chloroform, of ether, or of nitrite of amyl, are expedients, recourse to which may be necessary in some cases of otherwise uncontrollable convulsions.

(3) In the third place we proceed to consider the treatment appropriate to particular symptoms.

Contractures.—These are amongst the most troublesome of hysterical manifestations. They are usually accompanied by some disturbance of the cutaneous sensibility either in the form of anæsthesia or hyperæsthesia. These spasmodic contractions may appear suddenly at the end of a convulsive attack and remain till the end of another attack, when they will suddenly disappear. They may attack almost any group of muscles. In case of the existence of any doubt as to their true nature, the patient should be brought under the influence of chloroform or ether, when the contraction will disappear. Hysterical abdominal tumour is of this nature, and will disappear on the administration of an anæsthetic. Forcible compression or traction on the contracted part, and the application of induction currents, together with *appropriate treatment of the general constitutional state* on the principles already laid down, may succeed in overcoming some of those manifestations. Weir Mitchell * quotes an obstinate case of this kind, in which, after traction and electricity and other measures failed, a cure followed the fullest hypodermic injection of atropine that the patient could bear thrown directly into the rigid muscles. As soon as the atropine produced relaxation of the limb, it was manipulated and moved in different directions, upwards, downwards, and sideways.

Attempts to forcibly extend a spasmodically flexed limb may give rise, as Weir Mitchell has pointed out, to general convulsions, and must, of course, then be desisted from ; he also states that he has thrice seen section of the tendo Achillis prove valuable.

Paralysis of various sets of muscles, and of various sensory areas, are met with in hysterical states. Moral or coercive treatment will suffice in some cases to cure them. We once saw a case of hysterical paraplegia in a young girl, the true nature of which had not been apprehended. Chloroform was administered for diagnostic purposes, and as she passed into the stage of excitement she began to throw about the "paralysed" lower extremities. We had her, after this, got out of bed daily and placed in the middle of the ward, where she was left to find her way back to her bed; this she soon did, and in a very short time left the hospital perfectly well. There was in this case complete cutaneous anæsthesia of both lower limbs. In another case of hysterical partial loss of power of the lower limbs in a hospital out-patient, we insisted on her putting aside her crutches and walking home without them. This she did, and never used them again. But there are few cases so easily cured as these. The application of electricity, of massage, and of the methods of hydrotherapy is of great value in the treatment of these hysterical paralyses. Some have found putting a narrow strip of blistering plaster completely round the limb of great service.

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* "Lectures on Diseases of the Nervous System," p. 126.

Weir Mitchell recommends massage and electricity together with careful attention to any other functional disorders that may co-exist; *e.g.* in a case of motor and sensory paraplegia, finding that the patient suffered from acid regurgitations he put ner on an exclusive milk diet containing 2 grains of sodium bicarbonate to the ounce. "Secure," he says, "to such cases a quiet, unemotional life, and with the renewal of healthy nutritive functions the sensory failures will in turn cease to exist." . . . "The cures of those cases are to be made by a slow, steady, hopeful training of the will powers through every-day effort, which needs some caution not to err in the way of excess . . . a case is urged and scolded, and teased and bribed and decoyed along the road to health . . . this is what it means to treat hysteria." *

No additional special treatment is needed for the disturbances of sensation which almost invariably accompany these motor paralyses.

The treatment of a special and common form of hysterical paralysis needs, however, a brief notice. We refer to **aphonia** from hysterical palsy of the vocal cords. These cases need general tonic and supporting treatment, and the local application of the faradic current to the larynx. One pole is applied externally over the larynx, and by means of a suitable laryngeal director provided with a button for making contact, the other pole may be applied to the interior of the larynx itself; on contact being made, the patient should be firmly commanded to make some sound such as "ah!" or to say "one, two, three." We have often found touching the neck or face, or even the hand, with the laryngeal pole and making sudden contact, and at the same time commanding the patient to speak, answer quite as well as touching the interior of the larynx. The great trouble in these cases is the tendency to constant recurrence. A pill of 1 or 2 grains of valerianate of zinc twice a day is an excellent aid to other treatment.

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* "Lectures on Diseases of the Nervous System," p. 36.

The most appropriate treatment of *hysterical joints* is the application of induction currents together with massage, and the setting aside of bandages and crutches.

Gastric symptoms, and especially persistent hysterical vomiting, are best encountered by forced feeding by means of a funnel and tube, such as is used in the feeding of the insane, the latter being, if necessary, passed along the floor of one or other of the nasal passages into the œsophagus and stomach.

NEURASTHENIA.

Closely allied and, in some cases, almost inseparable from hysterical states are those morbid conditions to which, in modern times, has been applied the term neurasthenia.

This condition of the nervous system is characterised by a combination of exhaustion, or feebleness, and irritability. The symptoms most commonly complained of are sleeplessness, great *muscular debility*, headache, and backache, dyspepsia with loss of appetite and constipation, mental weariness, incapacity and unrest, and an irritable, capricious, uncontrollable temper.

Less constant but occasional symptoms are anæmia, palpitation, spinal hyperæsthesia, vague erratic pains, and ovarian tenderness; and in some cases we may encounter also all the symptoms which characterise the hysterical state.

It is in cases of this character that the **"rest cure,"** devised by Weir Mitchell, has proved so remarkably successful. But there can be no sort of doubt that it has been applied far too indiscriminately, and that for this, as indeed for any special method of treatment, a careful selection of suitable cases is needful. This cure would appear to commend itself far less to the Latin races than to the Anglo-Saxon, for we are not aware that it has ever taken any deep root in France, where perhaps the practice of hydrotherapy sufficiently meets the wants of the corresponding class of patients. There are also many great drawbacks to the application of this method; it involves for a time complete separation from family ties, and very costly nursing and medical attendance. It is unsuited to the hypochondriacal, for whom forced inactivity is most prejudicial; these rather need enforced activity with change of scene and environment. Cases of chronic ovarian disease requiring surgical interference, cases of acute uterine disorder, cases of chronic tuberculosis, and of advanced Bright's disease are also unsuitable.

The cases that are especially adapted to the rest-cure are those that Sir William Gull described as cases of *anorexia nervosa* or *hysterica*, in which we find absolute loss of appetite and loathing of food, with quite a phenomenal amount of emaciation. Other suitable cases are those forms of hysteria and neurasthenia with localised contractures, paralyses, hyperæsthesias, and anæsthesias, with great loss of moral tone, and a morbid desire for sympathy and attention. Certain distressful mental conditions originating in family worries, in love troubles, or in religious excitement are also often greatly benefited by this method of treatment. It suits women, for obvious reasons, much better than men. The origin of many of these neurasthenic cases is in a hasty return to domestic and social duties after incomplete convalescence from some severe illness; or it arises in a struggle between a mistaken or exaggerated sense of duty, and the physical inability to cope with its demands; or the distress of some unrelieved chronic disease is concealed and is neglected until a serious state of physical and moral debility is induced.

The "**rest cure**" comes to the relief of many of these otherwise intractable cases. The means it employs are isolation, rest in bed, passive exercise, electricity, and a rigidly ordered diet. Women are advised to begin treatment immediately after a menstrual period.

The **isolation** must be very complete. Removal from home and family is essential; no sympathetic relative or acquaintance must be seen; no letters are to be sent or received; and for the purpose a private hospital or home is the best. The only persons allowed to see the patient are the doctor, the nurse and the masseuse. The nurse should be young and previously unknown to the patient. She must be observant, educated, intelligent, tactful, conciliatory, and discreet. If a nurse does not get on well with the patient she had better be at once changed. The duration of the seclusion must be from six to eight weeks in milder cases, while many months may be needful in the more inveterate forms of hysteria. Towards the end of the period some of the rules may be somewhat relaxed, and a limited number of short letters may be written and received. "Isolation is not a matter of weeks and months, but of results. The results which we desire to obtain are to separate the patient from the habits of long illness, from the too tender solicitude of her family or friends, to restore the enfeebled will-power and strengthen the morale and make the invalid once more able to bear her part in everyday life." *

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* "Rest Cure for Neurasthenia," by J. K. Mitchell, M.D. Hare's "System of Practical Therapeutics," vol. i. p. 234.

The amount and strictness of the **rest** must be adapted to individual requirements. When there is evidence of great cerebro-spinal exhaustion the rest must be most absolute, even to the extent of not allowing the patient to feed herself or to turn herself over in bed. No conversation is allowed. Thus absolute inactivity is assured to the over-strained nerve centres. As improvement becomes manifest, some relaxation of this rule may be permitted; the patient may sit up in bed for her meals, and after five or six weeks she may sit for ten minutes twice a day in a chair while her bed is being arranged. This sitting-up period is increased gradually to an hour twice a day. A little walking exercise may now be permitted. After ten days a short drive may be taken, the patient being carried in a chair up and down stairs and to the carriage. As some hysterical patients rather shirk this return to relative activity it must be firmly insisted on. After complete recovery, a certain amount of absolute repose daily should be ordered, as an hour after each meal.

As to **diet.** In cases of entire loss of appetite, or of hysterical anorexia, it is best to begin with absolute milk diet. Skimmed milk only should be used, and at first in quite small quantities at a time. As soon as tolerance of the diet is established, 4 ounces, warm or cold, increasing to 8 or 10 ounces, should be given every two hours.* After four or five days of milk diet a chop is ordered at noon, and the next day, in addition, some bread and butter at supper. Some slight increase of these two meals is slowly made for a few days, and then some more food is given for breakfast. If the patient is digesting well, she soon gets to three full meals a day and about 2 quarts of milk. A portion of this milk may then be replaced by some suitable and agreeably prepared and pre-digested food.

Systematic **massage** is another most important part of the "rest cure." It should begin within the first two days of confinement to bed, and should at first consist of "gentle stroking of the whole body for from 15 to 20 minutes, for two or three days, then going on to thorough deep massage of the entire surface of the body and limbs, exclusive of the head and neck, and be rapidly increased in duration to an hour or an hour and a half daily." It is, of course, important that the massage should be properly performed; the best test of this "is the patient's power of consuming and digesting food," but if "the patient's weight increases with abnormal rapidity, either the massage is not sufficiently thorough" * or the diet needs modifying. A deposit of lithates in the urine must also be regarded as evidence that the patient fails to utilise the amount of food taken. Thorough massage of the abdomen is especially desirable in view of the frequency of obstinate constipation in these cases.

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* Some further minor details will be found in the Author's "Food in Health and Disease."

Electricity is, according to Weir Mitchell, the least necessary part of this treatment. A slowly interrupted mild faradic current should be used to the muscles once a day, going all over the body; this produces slight contraction of each muscle and distinctly raises the patient's tone. "After the daily faradisation of the muscles has been completed, in cases in which the spinal centres seem affected the use of the rapidly interrupted current through the spinal cord does good, placing one pole on the nape of the neck and a large electrode on the soles of both feet" (*Mitchell*). This should last for fifteen minutes.

Electricity and massage combined leads to excessive waste of tissue: it also leads by promotion of digestion and circulation to improved assimilation, so that an excessive amount of food can be consumed to make up for this waste. The final outcome is a great acceleration of tissue changes.

Should any signs of dyspepsia occur during the excessive diets, it should be met by a return to the absolute milk diet for a day or two.

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* Dr. J. K. Mitchell, in Hare's "System of Practical Therapeutics," vol. i. p. 238.

In addition to these measures, good may be obtained from the use of certain medicines to fulfil definite indications — such as the preparations of iron, quinine, strychnine, arsenic, a solution of mixed hypophosphites, cod-liver oil, malt extract, etc. Mitchell recommends in anæmic cases that large doses of the pyrophosphate or lactate of iron, 5 to 20 grains, thrice a day, should be dissolved in the malt extract, as much as 3 ounces of which may be given at each meal; he also proposes a cheap substitute for malt extract, made by adding a teaspoonful of dry malt to 3 ounces of good brown stout.

During the "rest cure" certain troubles may need special treatment. Insomnia may at first need a few nightly doses of some hypnotic to break through the habit of sleeplessness, and sulphonal is, perhaps, the least objectionable. This drug must either be begun an hour or two before you desire to induce sleep, 5 or 6 grains every half-hour, or if *prompt* action is wished for, it is best given in a full dose, 15 to 30 grains dissolved in boiling water and drunk as hot as the patient can swallow it. Or the "drip-sheet" may be applied if restless and wakeful at night. For the management of the often troublesome *constipation* the reader is referred to what has already been said under that head. Swedish movements are frequently of value in leading the patient again gradually to a life of free muscular exercise. The means of restoration to health, here described, must, during convalescence, only be slowly and gradually quitted, and they will be found, in most cases, to be needed in a diminished and modified degree for some time. From six weeks to three months may be taken as the average time needed for this cure. Change to the sea, the mountains, or to the country, in suitable seasons, will be of advantage in confirming the cure.

SCHEDULE OF FULL "REST TREATMENT."*

Miss A. B.:—

7 a.m. Cocoa. Cool sponge-bath with rough rub, and toilet for the day.
8 a.m. Breakfast with milk. Rest an hour after.
10 a.m. 8 oz. peptonised milk.
11 a.m. Massage.
12 noon. 8 oz. milk or soup. Reading aloud by nurse half an hour.
1.30 p.m. Dinner. Rest an hour.
3.30 p.m. 8 oz. peptonised milk.
4 p.m. Electricity.
6.30 p.m. Supper with milk. Rest an hour.
8 p.m. Reading aloud by nurse half an hour.
9 p.m. Light rubbing by nurse with drip-sheets.
3 oz. malt extract with meals; tonic after meals.
8 oz. peptonised milk with biscuit at bed-time, and a glass of milk during the night if desired.
Laxative (cascara), 10 to 30 drops occasionally.
Later, Swedish movements are added after the massage.

ADDITIONAL FORMULÆ.

Mixture in hysterical attacks.

℞ Tinct. valerianæ amm., ½ oz.
Spr. ætheris comp., ½ oz.
Tinct. lavand. comp., ½ oz.
Tinct. hyoscyami, 160 mins.
Aquæ camphoræ ad 12 oz.

M. f. mist. Three tablespoonfuls every two or three hours. (*Ashwell.*)

Pills for hysteria.

℞ Extr. hyoscyami, 25 grains.
Extr. valerianæ, 25 grains.
Zinci oxidi, 25 grains.

M. et divide in pil. 50. One or two for a dose. (*French Codex.*)

Pills for hysteria.

℞ G. camphoræ, 1½ dram.
Asafœtidæ, 1½ dram.
Extr. belladonnæ, ½ dram.
Extr. opii, 8 grains.
Gum acaciæ et syrupi, q.s.

Ut f. pil. 60. One to six pills daily, gradually increased. (*De Bregne.*)

Drops for hysteria.

℞ Tinct. asafœtidæ, 4 drams.
Tinct. castorei, 3 drams.
Tinct. opii, 1 dram.

M. f. tinctura. Fifteen to thirty drops in water for a dose twice or thrice daily. (*German Pharmacopœia.*)

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* From J. K. Mitchell's article in Hare's "System of Practical Therapeutics," vol. i. p. 245.

Enema for hysteria.

℞ Extr. valerianæ, 2½ drams.
Camphoræ, 12 grains.
Vitelli ovi, 1 grain.
Tinct. opii, 20 drops.
Aquæ ad 10 oz.
M. f. enema. (*Bourdon.*)

Pills for hystero-epilepsy.

℞ Cupri sulphatis, ⅕ grain.
Argenti nitratis, 6 grains.
Zinci valerianatis, 3 grains.
Extr. belladonnæ, 1½ grain.
Extr. glycyrrhizæ, q.s.

Ut f. pil. 20. A pill three times a day after meals. (*Benedikt.*)

Pills for hysterical globus.

℞ Asafœtidæ, 75 grains.
Extr. valerianæ, 30 grains.
Extr. taraxaci, q.s.

Ut f. pil. 60. Two pills daily. (*Bamberger.*)

Drops for the same.

℞ Tinct. valerianæ æther., ½ oz.
Spr. ætheris nitrosi, 3 drams

M. Fifteen drops in water three times a day. (*Bamberger.*)

Tonic pills in hysteria.

℞ Ferri sulph., 36 grains.
Sodii bicarb., 30 grains.
Extr. valerianæ, 24 grains.

M. et divide in pil. 24. Two pills twice a day.

Pills for hysteria.

℞ Zinci valerianatis, 24 grains.
Quininæ valerianatis, 24 grs.
Ferri valerianatis, 24 grains.
Extr. aloes aquosi, 12 grains.

M. et divide in pil. 24. One three times a day after food. (*Whitla.*)

Part VIII.

CONSTITUTIONAL DISEASES.

CHAPTER I.

THE TREATMENT OF ACUTE RHEUMATISM.

Nature and Characters of the Disease — A general Febrile Disease with local Manifestations—Symptoms—Etiology—Pathology—Rheumatic Hyperpyrexia—Subacute Cases—*Indications for Treatment*—Rest—Diet—Alkaline Drinks, with Milk—Local Applications — Blisters, etc. — *Salicylates and Salicin.*—Toxic Symptoms from Salicylates—Importance of Purity of Drug—Choice of Preparations—Doses—Salophen —Oil of Wintergreen — Salol — Sodium Benzoate —Opium—*Alkalies*—A Combination of Alkalies and Salicylates—Free Consumption of Pure Water — Quinine— Antipyrin, etc.—Potassium Iodide in Subacute Cases— "Dry Diet"—Treatment of Hyperpyrexia—Cold Bath—Treatment of Convalescence. Additional Formulæ.

Acute rheumatism is a disease of very frequent occurrence in England; it is characterised by fever and by the occurrence of inflammation in certain of the synovial membranes, with a tendency to attack the endocardium particularly, and less frequently one or other of the serous membranes.

The synovial membranes of the joints of the *extremities* are those usually attacked, and the pericardium (next to the endocardium) is the most frequently affected of the serous membranes. The pleura is, however, more frequently affected than is generally recognised, and in rare instances the peritoneum does not escape. It is important to recognise this specialisation of the inflammation to parts of related, if not identical, structure and functions. The serous membranes and the endocardium not only resemble the synovial membranes in structure, but they also subserve an analogous purpose, that of facilitating the functional movements of internal organs.

In the great majority of cases, the joint affection does not involve any anatomical changes, beyond inflammatory hyperæmia of the synovial membrane, and effusion of fluid into the joint, and this is consistent with the common observation of the often remarkably rapid subsidence of the articular inflammation and swelling, and the manner in which the inflammation will quickly subside in one set of joints and attack others. The joints, though swollen and very painful, are not very red; and the patient's sufferings depend greatly on the number of the joints involved. In *subacute* cases the joint affection may be slight, and the pains also; and in a few rare instances there may be endocarditis without any notable joint inflammation.

The knees are the joints most frequently affected, the shoulders and ankles next, then the wrists and hands and the elbows. It rarely attacks the hips, and still more rarely the toes, and in the other joints of the body it is scarcely known. Acute rheumatism is also peculiar in the tendency it has to move rapidly from joint to joint.

A remarkable observation of Graves, bearing on the pathological nature of this disease, was that the fever may occur alone, without any joint affection; and another important fact is that the pericardium or the endocardium, or one or other pleura, may, for a time, be the only membrane affected (what we have been in the habit of terming the *visceral joints*). Acute rheumatism must, therefore, be regarded as a *general* febrile disease, with *local* manifestations.

In acute cases of average severity the temperature usually rises to 103° or 104° F. early in the disease, from the second to the fourth day. In *subacute* cases it may range between 100° and 102°. The pulse is rapid, the tongue coated with a thick white fur, the skin often bathed with sour-smelling perspiration; and connected with this great loss of water from the surface there is great thirst (with loss of appetite), and the *urine* is scanty, high-coloured, dense, and deposits an abundance of lithates. The chlorides have been found much diminished, and even absent (*Osler*).

The tendency to the development of endocarditis and pericarditis, in the course of this disease, is an important point to bear in mind; and we should also remember that these complications are more liable to occur the younger the patient is. The pleura also is often involved, though this is frequently overlooked.*

Acute rheumatism, when left to follow a *natural* course, untreated, is apt to be prolonged and tedious; and we may claim to have made some advance in its treatment since the days of that physician, quoted by Sir T. Watson, who, when asked what was good for acute rheumatism, answered, "Six weeks!"

With regard to the *causation* of acute rheumatism, it is apt to be set down, without sufficiently careful inquiry, to exposure to cold and wet, and this may be the case in a certain number of instances, but in very many patients no such exposure can be discovered. American writers consider the season of spring favourable to the occurrence of acute rheumatism, but this does not appear to be the case in Great Britain. Over-exertion and muscular fatigue are also regarded as causes; but it is probable that these depressing conditions simply produce a loss of the normal power of resistance to the exciting cause of this, as of other, acute diseases. An *inherited* constitutional proneness to this disease no doubt often exists. Youth is a predisposing cause; it is, however, rare under ten years of age. The greatest number of cases appear to occur between ten and twenty.

We are not yet acquainted with the *true* nature of acute rheumatism; the *lactic acid* theory, which refers this disease to the accumulation of that substance in the blood, although repeatedly advanced, has never been established; the *nervous* theory, which attributes it to trophic nerve disturbances resulting from chill, has even fewer adherents; while the latest view, that it is a *bacillary* infection, meets with much opposition.

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* Lebert found pleurisy in 10 per cent. of his cases.

In support of the last hypothesis the analogy is urged between the phenomena of acute rheumatism and those of gonorrhœa, scarlet fever, and other septic processes; micro-organisms have also been found in the blood, but none of a distinctive and specific character.

The great liability to **relapses** must be borne in mind in the management of these cases.

Apart from the consequences of the cardiac lesions it may induce, and the occasional, but rare, occurrence of rheumatic hyperpyrexia, this disease is scarcely ever fatal. A few words must be said relative to the occurrence of hyperpyrexia before we pass on to the main part of our business, viz. the discussion of the treatment of this malady.

Occasionally, in apparently favourable cases, hyperpyrexia may suddenly supervene, the temperature rising as high as 109° to 110°, or even higher, and with this rise of temperature certain *cerebral* symptoms usually appear, convulsions, or violent delirium, or drowsiness, and, finally, coma. French authors term these cases, cases of *cerebral rheumatism*, but hyperpyrexia may occur, and the temperature rise to 108°, or even to 110°, without cerebral symptoms. The pulse is fast and feeble, and there is extreme prostration. Warning symptoms of the approach of this complication are a cessation of the sweatings, a disappearance of the pains, and a restoration of the mobility of the joints.

The **subacute** cases are often excessively tedious, and of very slow progress, and much less amenable to treatment than the acute forms. A sub-febrile temperature, about 99° or 100°, will continue with but slight fluctuations, and with an occasional rise to 101° or 102°, for many weeks. These are, perhaps, amongst the most tedious cases we see in the hospital wards.

In the absence of any definite *causal indication*, we may formulate the following general and symptomatic **indications** for the **treatment** of this affection.

(1) To lessen the local articular inflammation and severe pain by rest and pain-relieving remedies.

(2) To modify and change, if possible, the morbid state of the blood and other fluids.

(3) To protect the heart, so far as we possibly can, from serious and permanent injury.

(4) To take suitable measures to immediately reduce *hyperpyrexia* should it arise.

(5) To guard against the tendency to relapses by careful supervision during convalescence.

The first indication will be promoted by ordering the patient absolute rest in bed from the earliest appearance of the symptoms. There will be no difficulty in enforcing this in the severe or average case; but in subacute cases, without much joint inflammation or pain, it may not be so easy; and then we may have to point out to the patient the serious risk he runs of bringing on cardiac complications by the neglect of this indication.

As the patient will have to remain in bed probably for some weeks, and for some days, at least, will suffer from profuse perspiration, it is most important, for his comfort, that the bed should be well arranged. A feather-bed is obviously unsuitable; a soft hair-bed, on a good spring mattrass, is the best. It is not necessary that he should lie *between* blankets, as is often suggested, as this proves very heating and uncomfortable to many; but he should *lie on* a soft, thin blanket, and be covered by a cotton sheet. This will be all that is necessary in order to prevent unpleasantness from the profuse perspiration. He should have a loosely-fitting night-dress of soft, thin flannel, with frequent changes, as this dress becomes quickly saturated with the sour-smelling perspiration; and it is a good plan, in order to facilitate examination and dressings, for the night-dress to open down the whole length in front, and very freely on the outside of the sleeves; a light flannel cape may be worn over the shoulders. When the joints of the lower limbs are very painful and swollen, the weight of the bed-clothes may be kept off by a low cradle. The patient must not be allowed, even if he wishes, to get out of bed to evacuate either bowels or bladder.

The **diet,** while the fever and joint inflammation are present, should be of the lightest possible kind, cooling, and entirely fluid. A jug containing a pint of milk diluted with a pint of boiled water, and containing 30 or 40 grains of bicarbonate of soda, and 10 to 20 grains of common salt, and cooled by a lump of ice, should be kept near the patient, and a tumblerful given him frequently. He may take in this way 3 to 4 pints of milk* in the twenty-four hours. Another jug should contain a decoction of lemons, made by roughly tearing a lemon to pieces and boiling it for ten minutes in a pint of water, and straining, and then adding 20 to 30 grains of bicarbonate of potash, and some ice to cool it. This may be freely drunk in the intervals between the milk. The free consumption of these pleasant alkaline and cooling drinks answers the important indication of altering and improving the blood condition by diluting noxious substances in it, and supplying the great loss of water that is taking place by the skin, as well as of maintaining the alkalinity of the fluids. Whey may be taken instead of milk if the latter should by chance disagree, which it is most unlikely to do, if given in the manner we have suggested.† Thin oatmeal gruel and barley water are also permissible, but all meat extracts or broths are particularly counter-indicated in the febrile stage and when the urine is dense and high-coloured. A cup of weak tea may be taken in addition if desired. After the febrile stage, light clear soups and broths may be given, flavoured with vegetables and savoury herbs. A little pounded beef or chicken and some crumb of stale bread may be mixed with the soups; light farinaceous puddings, bread and milk, and such foods are also suitable. All alcoholic beverages are to be avoided, save in quite exceptional cases. In unduly protracted cases some forms of light animal nourishment may have to be given, although the temperature may still be febrile. We prefer pounded meat added to light broth rather than strong beef extracts.

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* Biot, of Lyons, has found a milk diet of itself an excellent remedy in acute rheumatism, relieving the pain and lowering the temperature. He considers it acts by stimulating the renal functions. The combination we have advised above will frequently be found to exert a remarkable diuretic effect.

† It will not fail to be noticed that if the patient drinks three jugs of the milk and water prepared as directed, and three jugs of the lemon drink in twenty-four hours, he will have taken at least 90 grains of sodium bicarbonate and 60 grains of potassium bicarbonate dissolved in a large quantity of water—about 150 ounces. It will also be seen that we propose that some of this fluid should be the vehicle for the administration of his medicines. This quantity of fluid is not excessive, considering the loss by the skin in the acute stage.

Besides absolute rest for the inflamed joints (which may sometimes be promoted by the adaptation to the limb of suitable splints) some form of *local* treatment for the purpose of relieving pain and reducing inflammation is usual and often beneficial.

The application of **blisters** to the joints has, from time to time, received warm approval, although at present it is but rarely adopted, probably because our general remedies prove so much more efficacious in relieving the joint affections than used to be the case. Blisters may be applied either after the manner recommended by the late Dr. Herbert Davies, who applied the blisters *directly* to the inflamed joints, as for instance, 3 inches of cantharides plaster *around* the knee, a plan adopted also by Fraentzel in Berlin; or according to the plan of Lasègue, of Paris, which we think preferable—namely, to apply a strip of blistering plaster $1\frac{1}{2}$ to 2 inches wide, an inch or two above and below the inflamed joint. We still adopt this method, and often with great advantage, in the somewhat protracted cases, in which the joint affection does not readily yield to the popular treatment with salicylates. Most authorities admit that blistering the joints is attended with relief of pain and diminution of inflammation, but that with our modern methods of treatment it is rarely needed, and that it has the decided disadvantage of tending to cause renal and vesical irritation. It has never been our lot to see either renal or vesical irritation produced by blisters, and we believe it rarely, if ever, occurs, except from their improper use and unskilful application. A practitioner who is unwise and incautious enough to blister a great number of joints *at once*, or to use very large blisters, or to leave the blisters in contact with the joints for many hours longer than necessary for the purpose of counter-irritation, may certainly run the risk of causing some irritation or inflammation of the kidneys or bladder; but if one or two joints only are blistered at a time, if only *small* strips of blistering plaster are used, and if they are not kept on more than three to five hours, according to the sensitiveness of the skin, and if the blister is properly and skilfully dressed, there will be little or no danger of this untoward result.

Osler recommends the light application of Paquelin's cautery as superior in its effects to blistering, and Whitla speaks very highly of a method of blistering advocated by Dr. Harkin, of Dublin; Dr. Harkin, as soon as it is clear that the case is one of acute rheumatism, applies one large blister over the cardiac region. Whitla testifies that "in almost all the cases there was a most rapid and remarkable relief of all the symptoms, pain in the affected joints sometimes disappearing entirely along with swelling and local and general high temperature."

When there is much pain in the joints, perhaps the best application is a lotion composed of one part of laudanum to six parts of hot water, with about 20 grains of sodium bicarbonate to the ounce; strips of lint or of soft linen are dipped in this lotion and applied to the joint, which is then enveloped in absorbent cotton wool retained by a light flannel bandage. Ichthyol ointment has been recommended to be rubbed into the joints, and may be applied in the more protracted cases.* Simply enveloping the joints in cotton wool will suffice in most instances.

We now pass to the consideration of the **general** internal medicinal **treatment** of acute rheumatism.

We will first consider the treatment by **salicylates** and **salicin,** a method which has certainly proved more efficacious than any other that has ever been advocated in the treatment of this disease. The first to use salicylic acid in acute rheumatism was Buss, of Basle, in 1875, then Stricker in Traube's clinic employed it, and published some of his results in January, 1876, and in the same year Maclagan published some cases he had treated with salicin. In 1877 Germain Sée advocated the use of sodium salicylate, and this salt rapidly displaced salicylic acid and salicin. Since then the salicylates have gradually and steadily gained in favour, and although like all new methods of treatment it has encountered a certain amount of criticism and opposition, it may now be said to be almost universally adopted. Osler, however, still maintains that "medicines have little or no control over the duration and course of this disease," and he concludes that the salicyl compounds "act chiefly by relieving pain, and do not influence the duration of the disease. Nor do they prevent the occurrence of cardiac complications, while under their use relapses are undoubtedly more frequent than in any other method of treatment." † Statistics, it is well known, may be made to prove anything, and we have a profound mistrust of therapeutic conclusions based solely on the statistical method; but if an experienced physician, with a fairly large and diversified field of observation, will interrogate his own personal experience, we are strongly disposed to believe he will find the treatment by salicyl compounds has led to the diminution of severe cardiac complications, and to the shortening of the duration of the disease. With regard to relapses, their apparent increased frequency is, we believe, accidental. The extraordinary rapidity with which the painful symptoms of the disease yield to the salicylates, causes a greater want of caution on the part of patients during the earlier periods of convalescence, and, therefore, to more apparent relapses.

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* Other local applications will be found amongst the formulæ at the end of this chapter.

† "Practice of Medicine," p. 277.

One of the first and most notable effects of the salicylate treatment is the subsidence of articular pain and swelling. Usually in twenty-four hours considerable relief is experienced, and both pain and swelling will often completely disappear within three to five days. At the same time there is generally a steady and rapid fall of temperature, and the patient may be quite free from fever in from three to six days.

With regard to the influence of this treatment on cardiac complications it must be noted, that those who have come to an unfavourable opinion as to the effect of the salicylate treatment in this respect, have based their conclusions on *hospital* statistics; now Gull and Sutton's observations, referred to by Fagge,* showed that if, in hospital patients with acute rheumatism, the heart is healthy on admission, it *rarely becomes subsequently attacked;* and to this important observation must be added another obvious reflection, that whereas the onset of cardiac complications can only be established clinically by the presence of physical signs, yet no doubt the first stage in the development of endocarditis may precede, by an appreciable time, the appearance of physical signs; so then, we may infer, that in cases in which the physical signs of endocarditis are observed in cases of acute rheumatism in hospitals, the endocardial inflammation has commenced before admission, and therefore before the patient has been submitted to the influence of the salicylates. In very many instances of treatment by salicylates, as has been repeatedly shown, the acute phase is practically over in less than three days; if physical signs of endo- or peri-carditis present themselves within this period it is pretty certain that the initial stage of these complications has preceded the commencement of the treatment, and therefore the only argument that could be justly deduced from such observations would be, that a cardiac complication once started the salicylates cannot arrest it. The experience of most hospital physicians must, we think, agree with our own that in cases of acute rheumatism with cardiac complications, and especially with *endo*-carditis, physical signs of this complication have either existed when the patient has been admitted, or been noted very shortly afterwards. Most physicians fully recognise the *indirect* influence of the salicylates in protecting the heart from injury, by diminishing greatly the total duration of the acute and active period of the disease; and even when a cardiac complication has already been excited, the salicylates, by lowering cardiac action and reducing vascular tension, which they do in a remarkable manner, and by relieving pyrexia, tend to prevent the advance, and to diminish the intensity of the endocarditis and to greatly reduce the gravity of the permanent lesion. This is the conclusion arrived at by Dujardin-Beaumetz, who maintains that by opposing the evolution of the malady the salicylates oppose a very real limit to the risk of cardiac complications;* and Whitla, chiefly from the prolonged observation of private patients, concludes that "a smaller percentage of those who have received salicylic treatment will eventually develop *permanent* valvular mischief." †

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* "Practice of Medicine," vol. ii. p. 707.

We have not found that relapses are more frequent, as has been stated, after the salicylates than after other methods of treatment, especially if the treatment is maintained, as it should be, in a modified form, for a fortnight after the cessation of the primary acute attack.

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* "Clinique Thérapeutique," vol. iii. p. 457.

† "Dictionary of Treatment," p. 768.

There are some cases in which we find an intolerance of salicylates, just as in other persons we find an intolerance of quinine, and then certain disagreeable characteristic symptoms become developed. Nausea, epigastric pain, and vomiting are sometimes produced; great cardiac depression with slowness of pulse has often been observed after long-continued full doses; giddiness, dimness of vision, deafness, and buzzing in the ears and headache, are sometimes complained of, and even delirium has been observed in some instances. An erythematous eruption on the skin has occasionally been noted, and also epistaxis and hæmaturia. The question has arisen whether these toxic symptoms are not sometimes due to **impurities** in the salicylic acid, and it has been maintained that they are far more liable to occur with the artificial than the natural acid. Professor Charteris has isolated a substance from the artificial acid and its soda compound, which he has been able to prove to be the cause of the toxic symptoms observed in many cases, and he has suggested a method for their purification. Great care should always be used in seeing that a pure preparation is dispensed.*

Women seem more susceptible to these toxic effects than men, while children bear salicylates remarkably well. Dujardin-Beaumetz points out that it is important to ascertain if these preparations are freely eliminated by the kidneys, for if this is not the case, owing to the existence of chronic renal disease, dangerous symptoms may arise.

Next, with regard to the best manner of administering the salicyl compounds and the doses necessary.

We may make use of either salicylic acid, or sodium salicylate, or salicin. The acid is the least desirable form, as it is very slightly soluble in cold water, and it is never desirable to give medicines in the form of insoluble powders when we can substitute a soluble salt of equal efficacy. It may, however, be dissolved by mixing it with a solution of acetate of ammonia or citrate of potash, about 40 grains of citrate of potash will dissolve 20 grains of salicylic acid in an ounce of water; but in this case decomposition takes place and potassium salicylate is formed. There is no objection whatever to this, especially if we desire to give some potassium salt with the salicylate. Salicylic acid may then be given dissolved in this manner, or sodium salicylate may be used instead, as is generally done. The dose of either is from 5 to 30 grains, according to the age of the patient and the severity of the attack, given at first every two hours. In an adult, if the attack is not a severe one, we may begin with 10-grain doses; if the attack is severe and the temperature high, it will be advisable to begin with doses of 15 or 20 grains or even more. If on the second day the pain and fever show no very distinct signs of abatement, we must increase the quantity given, and as much as 3 or 4 drams may be given in twenty-four hours; this may be given either every two (15 to 20 grains) or three hours (20 to 30 grains).

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* There is a very great difference in price between the *natural* sodium salicylate, which is 4s. an ounce, and the *artificial*, which is 6s. 6d. a pound! There is, however, an artificial salt known as "*physiologically pure*," which costs 11s. 6d. a pound.

If such doses produce no beneficial effect, it is advisable to discontinue it as inapplicable to the particular case under observation. We must be prepared, from time to time, with this as with nearly every other drug, to find particular instances of insusceptibility to its action. When, however, this remedy has its usual and characteristic effect, when it relieves the pain and brings down the temperature, we should not continue the large doses, but reduce them gradually until the patient is taking about 45 or 60 grains daily, and in such doses the remedy should be continued for a fortnight after the acute symptoms have subsided. The sodium salt should be given freely diluted with water, and as milk disguises its unpleasant taste, it may be given mixed with a wineglassful of the milk and water beverage we have already recommended. This will be found to simplify the nursing, as the medicine will thus be given together with a portion of the milk food.

Maclagan prefers salicin to the salicylates, and he gives it in large doses. The testimony of most other observers is that this drug has not so great an influence in reducing temperature or relieving pain as the salicylates, but it is certainly less depressing, and there is less risk with it of exciting toxic symptoms. We prefer it in mild cases, and in feeble, sensitive persons. It may be given at first in doses of 20 to 40 grains every two or three hours, and then, after it has subdued the acute symptoms, in smaller doses and less frequently. It is only sparingly soluble in cold water, and it is best, therefore, prescribed in powders combined with half as much potassium citrate and a few grains of sugar of milk. Each powder should be mixed with 3 or 4 ounces of warm milk and water.

Salophen, a crystalline substance composed of salicylic acid (51 per cent.) and *acetylparamidophenol*, has recently been recommended as a substitute for the salicylates in acute rheumatism. It is given in 15- or 20-grain doses in cachets, or in powder, washed down with water, thrice daily. There is already a certain amount of testimony in its favour. The fever is said to disappear rapidly, together with the articular swelling and pain. Its advantages are that it is tasteless and that its prolonged use is unattended by any unpleasant toxic effects. It does not appear to prevent relapses or to hinder cardiac complications.

Professor James Stewart, of Montreal, considers it a good plan to give the sodium salt for three or four days, and as soon as a decided impression has been made on the pain and fever to replace it with salicin, which is to be continued until all symptoms have disappeared. By this method, he maintains, we get the prompt and decided action of the sodium salt, while, by substituting salicin for it later, we lessen the risk of causing toxic symptoms.* Wood, Osler, and other American physicians claim that oil of wintergreen (*gaultheria*), which contains an impure salicylate of methyl, is as efficacious in this disease as salicin or the salicylates, and that it is not attended with the disagreeable effects of the latter; they give it in twenty-minim doses in milk every two hours, or it may be given in capsules. We do not consider *salol* a safe or suitable drug to be given in acute rheumatism, although it has been highly recommended.

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* Hare's "System of Practical Therapeutics," vol. i. p. 973.

Senator proposed *sodium benzoate* as a substitute for sodium salicylate in the treatment of acute rheumatism, and he gave as much as 2 to 3 drams daily. He claimed for this salt that it did not cause any toxic effects or disorder the stomach as the salicylates do, while it was as powerful a remedial agent.

The pain-relieving properties of the salicyl compounds has led to the disuse of **opium**, for the purpose of assuaging the pain and restlessness of sufferers from acute rheumatism. But this drug has, perhaps, been too completely set aside. Opium was found, before the introduction of the salicylates, a most valuable agent in allaying the pain and the cardiac excitement in severe cases, and its known influence over the capillary circulation may give it some control over the endocardial inflammation.

We still think that in cases with signs of commencing endocarditis and cardiac excitement, it is a good plan to begin treatment with a full dose of opium, such as 15 grains of Dover's powder, in a draught, combined with a dram or two of acetate of ammonia, and an ounce of camphor water, and to repeat this dose nightly for three or four nights. We should then give the salicylates only during the day, as we might look to the opium to procure several hours of quiet sleep at night. The constipating tendency of opium must be counteracted by a brisk saline aperient the following morning. We have treated many cases of acute rheumatism, with excellent results, by a few doses of opium at the onset, together with alkalies combined with quinine.

This brings us to the discussion of the **alkaline**

treatment of acute rheumatism, which we do not think should be wholly set aside for the salicylates, although we are convinced of the value of the latter. There certainly seems to be reliable evidence that free alkaline treatment diminishes the tendency to cardiac complications, and we are strongly disposed to think that the best treatment of acute rheumatism will prove to be a combination of the alkaline and salicylate treatments, together with the consumption of the largest possible quantity of **pure water** or milk and water.

Too little attention has been paid to the remarkable fact that the venous blood in acute rheumatism is rarely capable of exciting endocarditis, the endocardium of the right side of the heart enjoying almost complete immunity from inflammation. The explanation usually put forward to account for this, *i.e.* the greater functional activity of the left side of the heart, is obviously wholly inadequate. The conditions are practically the same on the two sides of the heart, save that on the *right* side the endocardium is in contact with venous blood, and on the *left* side with arterial; and it must also be borne in mind that the right side of the heart does not *invariably* escape. It would seem, then, that there is some substance in the blood, in this disease, which, after it has been brought under the influence of the atmospheric oxygen in the lungs, is rendered capable, or far more capable than it was before, of exciting, in certain circumstances, inflammation of the endocardium. The remedy, therefore, which would protect the heart, would be some agent which, when added to the blood, would prevent this effect of the respiratory oxygen upon the toxic substance in it, until it had been eliminated or destroyed. Alkalies may probably act in this way. The advocates of the alkaline treatment pushed this method, perhaps, a little too far; and the large quantities of the potash salts, recommended by certain authorities, no doubt induced serious cardiac depression in some patients.

Little objection could, however, be offered to

Garrod's method, which was to give 20 grains of potassium bicarbonate every three or four hours, night and day, until the cessation of the fever, and with this he combined full doses of quinine; others have given 30-grain doses of potassium bicarbonate every three or four hours, until the urine is rendered alkaline.

Fuller's method was to dissolve 90 grains of sodium bicarbonate and 30 grains of potassium acetate in 3 ounces of water, and render this effervescent by adding an ounce of lemon-juice, and to give this dose every three or four hours until the urine became alkaline, when the dose was reduced, and only enough given to keep the urine alkaline. The lemon-juice treatment of Owen Rees was, as has been pointed out, but a modification of this, as lemon-juice may be regarded as a supercitrate of potash. A tendency has recently been manifested to adopt the method, we have already referred to with approval, of combining the salicylate with the alkaline treatment. We have long done so, and, we think, with much advantage. It will have been noted that, when describing what we believe to be the best dietetic management of these cases, we urged the importance of the very free consumption of watery fluids containing some alkaline salt. If the doses of the salicylates be added, as we have suggested, to those beverages, we shall obtain a combined alkaline and salicyl treatment; while the importance of the ingestion of large quantities of water, for diluent and eliminative purposes, cannot, we think, be over-estimated. Or the treatment may be commenced with 20-grain doses of sodium salicylate and 30-grain doses of potassium bicarbonate in 2 ounces of water every two or three hours, and this may be made to effervesce by adding to it a dessert-spoonful of lemon-juice, or 20 grains of citric acid; and when the temperature falls, the dose of salicylate may be diminished to 10 grains; and when the urine has also become alkaline the mixture may be given every five or six hours only.

In cases where there is reason to fear the depressing effects of these remedies, a dose of quinine should be given (2 to 5 grains), dissolved in lemon-juice, midway between the doses of the alkaline and salicylate mixture.

We may now summarise the chief of the preceding recommendations thus briefly:—Opium, at first, to relieve the pain and nervous distress and restlessness; saline purgatives for eliminative purposes; as free a consumption of water as possible for the same purpose, and to dilute and wash, as it were, the morbid blood; salicin, or salicylates, for their special effect on the joint affection and the pyrexia; alkalies for their modifying influence on the blood, and their established influence in protecting the heart; quinine for its tonic, as well as its antipyretic effects.

Antipyrin, *antifebrin*, and *phenacetin* have each been recommended in the treatment of acute rheumatism, but there is no sufficient evidence to warrant their adoption in preference to salicin and the salicylates. In cases unduly sensitive to the unpleasant effects of the salicylates, especially in females, a few doses of antipyrin—10 or 15 grains three times a day for a day or two—may be substituted with the view of relieving pain and reducing temperature; or phenacetin, in doses of 3 to 5 grains, may be given instead, and in some cases it certainly acts better than antipyrin. But we should object to the continued use of these drugs, and particularly of antifebrin (acetanilide) on account of its toxic effects on the hæmoglobin of the red blood corpuscles, and its depressing effect on the heart. We have not the same objection to the use of small doses of phenacetin, combined with quinine, in an effervescent alkaline mixture, and *salophen* may prove better than any of these. Prof. H. A. Hare, of Philadelphia, however, approves of acetanilide in the treatment of acute rheumatism; he has found it "relieve the pain, and so permit a refreshing sleep, in doses of 4 to 8 grains three times a day," while it does not "cause the excessive sweatings which necessarily large doses of salicylate are sure to produce," and which prove very exhausting to the patient.*

In lingering subacute cases, which have resisted the action of moderate doses of the salicyl compounds, *potassium iodide*, 5 grains three times a day, combined with 10 or 15 grains of potassium bicarbonate, will often be found very useful; but we cannot commend its use, as has been done, in acute cases or in the early stage.

Should evidences of *pericarditis* or *endocarditis* appear they should be dealt with according to the principles already laid down in the chapter on the treatment of these affections. The suggestion of a "dry diet" † in rheumatic endocarditis, for the reduction of blood-pressure, is, we consider, a most mistaken one. The salicylates, which produce most remarkable lowering of blood-pressure, are admitted to have no remedial influence over the endocardial affection; and to attempt to feed a patient suffering from acute rheumatism, who is sweating profusely and passing dense, high-coloured urine, with a "dry diet," in order to obtain some very problematical lowering of blood-pressure, is surely to misapprehend the situation entirely.

The occurrence of **hyperpyrexia**, and by that is meant a temperature over 105°, and continuing to rise, calls immediately for active measures for its reduction. The cold bath has been proved to be the most trustworthy means for this purpose. Dr. Wilson Fox was the first physician to apply this method in England, and the success which attended it, in his hands, even in extreme cases (in one the temperature in the rectum was 110°), encouraged others to follow his example. Recovery, however, does not always follow the cold-bath treatment, and death from collapse has been repeatedly recorded after reduction of the hyperpyrexia by this means, and death has occasionally occurred even during the immersion. It will be prudent, therefore, not to allow any unnecessary delay in the application of the bath; and as soon as the temperature, after steadily rising, notwithstanding such remedial measures as we have already set forth, reaches 105°, preparations should immediately be made for immersing the patient. If cerebral symptoms, such as convulsions, occur, even with a temperature of not more than 104°, we should not delay to employ the cold bath. The bath must be repeated as soon as the temperature again rises above 105°. As many as twenty-five or twenty-six baths have been given in the same case. The temperature of the bath must not be lower than 90° at first, otherwise the patient will feel an unpleasant chill on entering it; but so long as the temperature of the water is between 90° and 100° the immersion will be agreeable to him. After he has been lowered into the bath on a sheet, the temperature may be further reduced by the addition of lumps of ice, until it reaches 75° to 70°. When the temperature in the rectum has reached 102° the patient should be removed, as the temperature will continue to fall after his removal. On his return to bed some stimulant should be given him, a blanket thrown over him, and he should be allowed to sleep; should he show any signs of heart failure in the bath, stimulants must be freely given, and he must be at once removed to bed. It must be remembered that there is a great tendency to sink from cardiac failure in these cases, and free stimulation may be needful; as much as six ounces of brandy within an hour was given to one of Dr. Wilson Fox's successful cases, and warmth had to be applied to the back, and hot bottles to the feet. If a cold bath is not procurable, the next best measure is rapidly rubbing the patient with ice. Two nurses, each with a suitably-shaped large lump of ice, wrapped round with thin flannel, should repeatedly pass the ice over the whole of the anterior surface of the body, and at the same time a bag filled with pounded ice should be applied to the spine and back of the neck, and another on the head. The patient should also be constantly given fragments of ice to suck.

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* Hare's "System of Practical Therapeutics," vol. i. p. 975.

† Prof. James Stewart, of Montreal, in Hare's "System of Practical Therapeutics."

The favourable effects of the cold bath are to allay delirium, restore consciousness, reduce the rapidity and increase the strength of the pulse, and induce tranquil sleep, as well as lower the temperature.

It only remains to be said that the **convalescence** of a patient from acute rheumatism should be carefully watched. He should be kept in bed for a considerable time after all the symptoms of the joint affection have disappeared, and this is especially important in cases with any cardiac complication. In such cases the work of the heart should be minimised in every possible way, and chiefly by absolute rest for some weeks. The food, though nourishing, should be as light as possible, and chiefly composed of milk and farinaceous substances. Light broths, with fresh vegetables in them, are suitable; and some cooked fruit or fruit-jellies may be taken with light puddings.

We have already insisted on the propriety of continuing some salicyl preparation for a fortnight after the cessation of the acute symptoms, in order to guard against relapses.

If we give salicin, it is as well to add to each dose (thrice daily) 1 to 3 grains of quinine. On leaving off this medicine, the anæmic state which is apt to follow these attacks calls for some preparation of iron. The citrate of iron and quinine, in 5- to 10-grain doses, combined with 20 grains of potassium citrate, may be given three times a day; and when there are notable signs of cardiac debility, 3 or 4 minims of the liquor strychninæ should be added to each dose. The bowels should be kept regular by saline aperients. Patients who have had more than one attack, and in whom some cardiac affection has been left by the original illness, will require more supporting and tonic treatment during convalescence. They may require a certain amount of light animal food, eggs, soup, etc., and a small amount of some alcoholic stimulant. Cardiac tonics, such as digitalis and iron, may be needed; but prolonged rest in bed is one of the best tonics to these damaged hearts.

ADDITIONAL FORMULÆ.

Salicylate mixture for acute rheumatism.

℞ Sodii salicylatis, 3 drams.
Syrupi zingiberis, 1 oz.
Aquæ ad 6 oz.

M. f. mist. A tablespoonful every three hours.
(*Prof. J. Stewart.*)

Combined alkaline and salicylate mixture.

℞ Sodii salicylatis, 4 drams.
Potassii bicarb., 6 drams.
Liq. morphinæ hydrochlor., 1½ dram.
Aquæ camphoræ ad 16 oz.

M. f. mist. Two tablespoonfuls four times a day. (*Whitla.*)

Pills of salicylic acid.

℞ Acidi salicylici (nat.), 100 grs.
Gum acaciæ, 15 grains.
Mucil. acaciæ, q.s.

Ut f. pil. 30. Six to be taken every hour until buzzing of the ears occurs, then every four hours. (*Latham.*)

Bromide of ammonium mixture.

℞ Ammonii bromidi, ½ oz.
Tinct. aurantii, ½ oz.
Aquæ ad 3 oz.

M. f. mist. A teaspoonful every three hours. (*Da Costa.*)

Mixture and powders for acute rheumatism.

℞ Potassii acetatis, 1½ dram.
Potassii nitratis, 1½ dram.
Syrupi mori, 6 drams.
Aquæ ad 8 oz.

M. f. mist. A tablespoonful three times a day.

℞ Sodii salicylatis, 1½ dram.

Divide in pulv. 12. Take four powders a day. (*Billroth.*)

Salicylate of ammonia and soda mixture.

(Said to avoid unpleasant symptoms.)

℞ Sodii bicarb., 5 grains.
Ammonii carb., 5 grains.
Acid. salicylici, 20 grains.
Aquæ ad 1 oz.

M. f. haust. To be given for a dose. (*Prideaux.*)

Alkaline mixture with bark.

℞ Sodii bicarbonatis, ½ dram.
Potassii acetatis, ½ dram.
Tinct. cinchonæ, 1½ dram.
Dec. cinchonæ flav. ad 1½ oz.

M. f. haust. For a dose.
(*Fuller.*)

In subacute cases.

℞ Potassii iodidi, 1 to 2 drams.
Vin. colchici rad., ½ oz.
Syr. sarzæ co. ad 6 oz.

M. f. mist. A dessertspoonful three times a day after meals. (*Hare.*)

Lotion for the painful joints.

℞ Tincturæ opii, 1 oz.
Potassii carb., 4 drams.
Glycerini, 2 oz.
Aquæ ad 12 oz.

M. f. lotio. To be applied by means of lint. (*Fuller.*)

Application to the joints in acute rheumatism.

℞ Ichthyolis, 4 to 8 drams.
Adipis, 2 oz.

M. f. ung. Rub in well to the part affected. (*Hare.*)

Liniment for fixed pain in the joint.

℞ Ol. sinapis, 12 minims.
Spr. terebinth., 6 drams.
Lin. saponis, 6 drams.

M. f. lin. To be applied twice or thrice daily. (*Bamberger.*)

Alkaline mixture in effervescence.

℞ Sodii bicarb., 1½ dram.
Potassii acetat., ½ dram.
Liq. ammon. acet., 3 drams.
Aquæ ad 2 oz.

M. f. haust. To be taken in effervescence with

℞ Acid. citrici, ½ dram.
Aquæ, 2 oz.

M. (*Fuller.*)

Salicin and alkaline powders.

℞ Salicinæ, 2 drams.
Potassii bicarb., 1½ dram.
Sodii bicarb., 1½ dram.

M. et divide in pulv. 6. A powder, every three or four hours, dissolved in a wineglassful of hot milk and water.

CHAPTER II.

THE TREATMENT OF CHRONIC RHEUMATISM AND OF OSTEO-ARTHRITIS.

SIMPLE CHRONIC ARTICULAR RHEUMATISM—Mode of Origin—Relation to Acute Attacks—Exciting Causes, Cold and Wet—Characteristic Nature of Anatomical Changes—Symptoms—Sub-febrile Form. *Indications for Treatment*—1. *Local* Treatment — Counter-irritation — Friction and Movements—Iodine—Paquelin's Cautery—Stimulating Liniments—Hot Water and Vapour Douches—Analgesic Applications—Sulphur—Ichthyol—Electricity—Massage—Hot Baths—"Indifferent" Thermal and Sulphur Springs—Hydrotherapy. 2. *Internal* Treatment — Salicylates — Alkalies — Aperients — Potassium Iodide — Colchicum — Guaiacum — Sulphur—Iron—Arsenic—Treatment of Complex Cases. 3. *Hygienic* Treatment—Food—Beverages—Clothing—Dwellings—Climate —CHRONIC MUSCULAR RHEUMATISM—Myalgia—Nature—Symptoms—Lumbago—Torticollis—Pleurodynia—*Treatment*—Rest—Dry Heat—Counter-irritation — Vapour and Hot Baths — Massage—Anodyne Liniments—Methyl-chloride—Internal Remedies—Diaphoretics—Salicylates—Alkalies—Ammonium Chloride—Morphine hypodermically — Various Modes of Treatment adapted to different Chronic Cases—ARTHRITIS DEFORMANS, OR OSTEO-ARTHRITIS, OR RHEUMATOID ARTHRITIS—Anatomical Characters—Acute and Chronic Form—Symptoms — Etiology — Divergent views as to Curability and Treatment, and of Baths and Massage — Therapeutic *Indications* — Thermal Treatment — Electricity — Counter-irritation—Iodine—Friction—Internal Treatment—Salicylates—Iodine and Iodides—Sedatives—Tonics—Iron—Arsenic—Quinine—Cod-liver Oil—Dietetic and Hygienic Treatment.

CHRONIC RHEUMATISM.

So much difference of opinion exists as to the precise pathological nature, affinities, and appropriate nomenclature of certain chronic, painful conditions of joints, that it is somewhat difficult, in approaching the subject from the therapeutic point of view, to make it perfectly clear what are the morbid states, or better, what are the particular cases, we are contemplating. Chronic rheumatism may be **articular** or **muscular,** and it is to the existence and treatment of the articular form that we propose first to direct our attention. We say the "*existence*," because some writers of authority* appear to doubt that there is such a disease, and obviously, unless we can establish the existence of this affection, it would be a waste of time to describe its treatment. We may first explain what we do *not* include under chronic rheumatism. All purely *gouty* inflammations of joints, and all cases of true osteo-arthritis or arthritis deformans, we exclude; and we still think there is then left a large class of chronic joint affections which must, at present, be distinguished by the name of chronic rheumatism; and, as a further qualification, we would call this affection *simple* chronic articular rheumatism.

Many French authors are dominated by a *general* conception of the existence of "arthritism," that is, an inherited diathesis or constitution which determines a tendency to arthritic affections generally, and to which they refer diseases differing so widely as acute gout and arthritis deformans, which, however, they trace to a common origin or diathesis, and between which they see a pathological affinity.

It will appear that the appropriate therapeutic management of those different forms of arthritis differs considerably.

Simple chronic articular rheumatism is most commonly a chronic disease from the commencement, but occasionally, though comparatively rarely, it originates in an attack of acute or subacute rheumatism, and more frequently the latter. In such instances, one or more joints do not return to their natural, painless and healthy functions, but remain subject to more or less pain on movement, although there may be little or no swelling. In other instances, although the chronic joint affection does not immediately follow an acute attack, yet the *tendency* seems to be referrible to a former attack of acute rheumatism which has left behind a rheumatic predisposition; and there is also a well-marked *inherited* liability to such affections in the members of certain families. The most common exciting cause is exposure to cold and wet; it is on that account a very frequent disease amongst the hard-working poor, especially those who have to work in a damp atmosphere. Many who suffer from this complaint in a cold, damp climate, obtain complete freedom from their sufferings in a warm and dry climate. A characteristic distinction of this disease is its tendency to attack only one or a very few joints, and, although so chronic in its nature, to cause but little anatomical change in the joints affected—a slight injection of the synovial membrane, perhaps a little effusion, and some thickening of the capsule and ligaments, and adjacent sheaths of tendons. Such are the only anatomical changes in the majority of cases; and under appropriate treatment these changes will, again and again, entirely disappear.

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* Fagge says: "Chronic rheumatism ought to mean a chronic arthritis of the same pathology as the acute outbreaks of rheumatic fever. Such a disease, we may affirm, does not exist." Neither he nor Bristowe describes a chronic articular rheumatism apart from osteo-arthritis; on the other hand, Osler and Niemeyer recognise and describe this disease.

In old cases some erosion of the cartilages is occasionally found, and in affections of single joints some muscular atrophy may occur.

The **symptoms** of chronic articular rheumatism are pain and impaired mobility of the joint. The pain is aggravated by movement, by unfavourable changes of weather, and sometimes paroxysms of pain occur at night; there is usually some tenderness of the joint on manipulation, and we can often detect a distinct crackling or crepitation in it. There may be no swelling of the joint, or the swelling may be only apparent from atrophy of surrounding muscles, but at other times the joint may be more or less swollen from increase of synovial fluid. Another characteristic of cases of this kind is that the stiffness and pain often completely disappear with active or passive movements of the joint.

There is danger in some of these cases, especially if neglected, that anchylosis and deformity may occur, and that the general health may suffer from the enforced inactivity involved. In old people who are prone to this disease sclerotic changes in the cardiac valves are also apt to appear.

There is a form of so-called chronic rheumatism which consists, in reality, of repeated attacks of *sub-acute* rheumatism, and is accompanied by a certain amount of fever, a quick pulse, perspiration, and high-coloured urine, together with progressive emaciation and loss of power. Those are the most hopeless cases of all to treat.

The **indications** for **treatment** in this disease are (1) to relieve the pain, (2) to restore free movement to the joint, (3) to remove if possible the morbid constitutional state on which the disease depends, (4) to improve the general tone, and (5) to adopt a régime of life which may prevent the re-development of the constitutional tendency.

The measures at our disposal in order to respond to these indications may be thus classified :—

1. Local and external treatment.
    (*a*) Counter-irritants, anodynes, and other special agents, (*b*) electricity, (*c*) massage and movements, (*d*) baths and douches.
2. Internal and medicinal.
3. Hygienic and regiminal.

1. The great value of *counter-irritation*, or "revulsion," in the treatment of chronic rheumatism has been long established. We rarely, however, see those "recent cases" to which Niemeyer refers, which he maintains are more benefited by leeches and wet-cupping, frequently repeated at moderate intervals, than by any other treatment.

Flying blisters, in early cases, are of great use in commencing the treatment. Small blisters about the size of a florin, kept on from two to four hours, should be moved freely about over the circumference of the joint, the object being to produce general injection of the skin rather than a blister; the joint being at the same time enveloped in cotton wool. After a few days of this treatment, and when those parts of the surface that have been blistered are healed, gentle friction twice daily with the linimentum potassii iodidi cum sapone, and gentle passive movements, should follow. Unless the joint is hot and tender these movements should be steadily increased in extent.

The application of the linimentum iodi will frequently produce a blister, and is a very useful form of counter-irritation; a mixture of equal parts of the liniment and of the tincture of iodine is, however, a more convenient strength, as it can be applied for a longer time and the revulsive effect therefore maintained. The cuticle usually comes off after a few daily applications, and then the iodide of potassium liniment can be applied instead. Osler recommends the use of Paquelin's cautery as a counter-irritant. Many forms of stimulating liniments are used with advantage in slighter and more chronic cases. The following is a useful form:—

℞ Linimenti camphoræ comp. ... ... }
Linimenti sinapis comp. ... ... } āā 1 oz.
Olei pini sylvestris ... ... }
M. f. linim. To be rubbed in twice a day, and the joint packed in cotton wool.

When there are decided signs of effusion, the following combination may be applied spread freely on long strips of lint, and maintained in contact with the joint by a close-fitting flannel bandage.

℞ Linimenti hydrargyri ... ... }
Linimenti potassii iodidi cum sapone ... } āā 1 oz.
M. f. linim.

Niemeyer states that he has found a *powerful hot douche* one of the most efficient of revulsives, causing a hyperæmia of the skin lasting several hours. Vapour douches are also used in bathing establishments for this purpose.

When there is much pain in the joint, anodyne applications must be applied for its relief. Of these there are many. Equal parts of chloroform and belladonna, or of chloroform and opium liniments, are as good, perhaps, as any. After a warm douche, either of these may be applied on lint (saturated) and the joint enveloped in cotton wool. Equal parts of veratrine ointment and chloroform liniment rubbed up together makes a suitable application. Liniments containing menthol and aconite are also used.

The external application of *sulphur* is said by some authorities to have a special virtue in the relief of chronic rheumatism. The sublimated sulphur is rubbed in over the surface of the joint and adjacent skin, and some of it is also sprinkled over a layer of absorbent cotton wool, which is then applied round the joint and fixed by a thin flannel bandage. At the same time, in order to obtain the full effect of the sulphur medication a small teaspoonful of confection of sulphur may be taken night and morning, or a sulphur tabloid three times a day immediately after food. This treatment should be persevered in for two or three months at a time. *Ichthyol* lanoline ointment (50 per cent.) has been found of value in the relief of chronic rheumatism; after washing with hot soap and water this ointment is well rubbed into the affected joint twice daily, which is then wrapped up in cotton wool. Ichthyol contains sulphur, and is thought by some to act in the same way, and like sulphur it is also prescribed internally in capsules in these cases (5 to 10 grains). Cranstoun Charles has found a somewhat weaker ointment (30 per cent.) relieve the swollen and inflamed joints in subacute cases. There is no doubt that the friction and passive movements used in applying many of these remedies contribute greatly to the good results obtained.

Next as to the value of **electricity**: some consider it of not much use in the treatment of chronic articular rheumatism, others, however set great store by it, especially when combined with other treatment. Its use has been found to be attended by a subsidence of the pain, and a disappearance of the peri-articular thickening and exudation, as well as by an improvement in the nutrition of the wasted muscles. Erb and Niemeyer report the cure of obstinate cases after a few sittings. Some use weak and some strong continuous currents; these are passed through the joints by electrodes of thin metal plates (Niemeyer) placed on the surface of the articulation. If severe pain is caused at the negative pole the electrodes should be changed.

Massage *and systematic* **movements** of the affected joints play, perhaps (together with hot baths), the most important and efficient role in the cure of chronic rheumatism. Quite remarkable results are obtained by the long and patient employment of these methods, especially when combined with hot baths and douches; the swelling of the joint is reduced, anchylosis prevented, muscular atrophy checked, and often free movement of the limb restored.

"Before the stiff or painful joint is touched, massage of the limb above the joint should be instituted, consisting of strong kneading and centripetal stroking. In this way the capillaries and absorbents of the part on the cardiac side are put into a condition of readiness to take up and dispose of the effused material." *

The prolonged and systematic employment of **hot baths** has long been one of the most popular and universally recognised methods of treatment of chronic rheumatism, and since it has become the custom to combine with the use of the bath the application of massage and passive movements, even better results are now obtained.

The thermal springs chiefly resorted to for the cure of chronic rheumatism are the "*indifferent*" thermal baths such as Bath, Buxton, Wildbad, Gastein,

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* Dr. Benj. Lee in Hare's "System of Practical Therapeutics," vol. i. p. 326.

Ragatz, Schlangenbad, and Plombières; or the hot "*sulphur*" baths such as Aix-les-Bains, Aix-la-Chapelle, Baden in Switzerland, and Harrogate (where the springs are heated artificially); or the hot salt and brine baths such as Droitwich (water artificially heated), Nauheim, Bourbonne-les-Bains, Wiesbaden, Baden-Baden, and many others; or the pine baths and various kinds of mud baths, such as are obtained at Homburg, Marienbad, Dax, Saint Amand, Néris, Bormio, and elsewhere. The Americans resort much to Banff, in the Rocky Mountains, on the Canadian Pacific Railway. Seeing how various is the composition of the hot mineral springs that have attained an equally great reputation for the cure of chronic rheumatism, there can be little doubt that the chief curative agents are the high temperature of the bath, the prolonged immersion, and the skilful and judicious combination of douches, massage, passive movements, and electricity, which the physicians at these various stations employ.

The Scotch douche, that is, alternate streams of hot and cold water rapidly and briefly applied, has been found most serviceable in many cases of chronic articular rheumatism. Niemeyer states that he obtained just as good results by the use of suitable baths and douches in a well-constructed hospital as at these Spas; but he admits that it is better to send private patients to a well-organised bathing station. Very hot baths are rarely now used, unless in exceptional cases. The best temperature is one ranging between 95° and 102° F. About thirty consecutive baths are usually given in average cases, then a rest is desirable, and after a few months, in obstinate cases, the course may be resumed. The duration of the bath, the temperature of which should be maintained uniform, is usually about half-an-hour, but towards the end of the course many bath-physicians increase the duration of the bath even to an hour. Turkish and Russian vapour baths are not found so serviceable in this malady as warm-water baths. After the bath the patient should be wrapped in a flannel dressing-gown, and allowed to rest on a reclining-couch for half an hour or an hour.

Drinking the water at these thermal baths is quite a secondary matter. In some spas, as at Gastein, there is practically no mineral water drunk; at others, the bath-physicians think drinking useful, either to keep up the action of the skin started by the bath, or for the eliminative and cleansing effect of the free consumption of water. Some believe that by drinking the water, especially the salt and the alkaline-saline waters, change of tissue and the absorption of exudations are promoted and the general nutrition improved.

Hydrotherapy, unless limited almost exclusively to the application of hot or warm water, is not suited to old chronic cases, but in recent cases a careful and cautious application of hydrotherapy may prove very useful, as by hardening and improving the tone of the skin, the sensitiveness of the surface to external impressions of cold and damp may be greatly diminished. For the same reason, it is often advantageous, after a cure at a thermal spa, for the patients to pass a few weeks in a dry, bracing, sub-alpine resort, or at the sea-side, where a daily spray-bath of moderately cold water, followed by brisk friction, may prove restorative of muscular and nervous tone and vigour.

The only counter-indications of thermal treatment are advanced age, and the presence of renal or arterial degeneration, or considerable circulatory disturbances.

2. *Internal* medication has a very limited application in the treatment of simple chronic articular rheumatism. Salicin and the salicylates have little influence over these cases. They may be of use in the subacute form, or when a chronically inflamed joint becomes hot, tender, and painful; but in the typical chronic form of articular rheumatism, we are now considering, they are of little avail. No possible harm can, however, arise from trying them for a few days. Brandis of Aachen advocates the use of sodium salicylate, in very large doses, while taking a course of

the sulphur waters, but we are by no means convinced that this practice is sound. When the urine is dense, high-coloured, and strongly acid, and deposits lithates abundantly, alkalies should certainly be given until the urine assumes a healthy aspect.

Constipation also, if it exists, must be overcome, and elimination generally promoted. Potassium or sodium iodide often proves a very serviceable remedy, especially in those cases where elimination is defective; it should be given in 5- or 10-grain doses three times a day in combination with potassium bicarbonate and aromatic spirits of ammonia. Small doses of colchicum, added to an aperient pill, in constipated cases, and taken nightly are often attended with benefit.

Guaiacum and sarsaparilla are remedies which have been greatly praised in the treatment of chronic rheumatism, and guaiacum will, in some cases, act with remarkable effect, especially in relieving the nocturnal pains, if a full dose be taken at bed-time. It acts best, however, in cases of chronic *muscular* rheumatism; yet it has the drawback of quickly losing its remedial effect.

Guttmann has advocated *salipyrin* (a combination of salicylic acid and antipyrin) in the treatment of rheumatism. He states that it rapidly removes the pain and swelling of the joints. The dose is 15 grains, which he gives in cachets every two hours.

We have already alluded to the internal use of sulphur and ichthyol. In young people iron or arsenical tonics with cod-liver oil are useful in improving the resisting power and tone of the constitution.

The difficulty experienced by some in separating chronic articular rheumatism from chronic gouty arthritis, and the fact that gouty and rheumatic affections certainly appear together, not infrequently, in the same person, has no doubt contributed to the very varying estimates formed by different observers of the value of different medicines in this disease. For the relief of these complex cases a more complex medication will be needed; and when a case of chronic rheumatism is over-lapped, as it were, by gouty manifestations, internal remedies directed to the relief of the latter will also be needed.

3. Lastly, the **hygienic** and **regiminal** treatment of chronic rheumatism has to be considered. The food of such patients should be light, nutritious, and readily digested. The digestive peculiarities of individual patients must be observed, and as nutritious a diet prescribed as is consistent with the maintenance of healthy digestion. Whatever food tends to cause assimilative difficulties, a good test of which is the occurrence of deposits of lithates in the urine, should be prohibited. Fresh tender meat, poultry, game, and fish in strict moderation; fresh vegetables, stewed celery, Spanish onions, lettuce, watercresses, broccoli, and ripe and cooked fruits; rice, tapioca, and other farinaceous foods; butter, cream, milk; all these are admissible, provided that there is no digestive peculiarity which might cause any of them to disagree. A purely vegetarian diet has been found suitable by some patients. Fermented alcoholic drinks are best wholly avoided. Home-made lemonade and plenty of pure water are the best beverages. Avoidance of exposure to cold and damp, and thoroughly warm clothing and a warm bed should be insisted on. Too much clothing, however, is harmful, by producing an over-sensitiveness of the skin and confining the perspiration; but porous woollen garments, which, while keeping the surface of the body warm, allow of free cutaneous transpiration, should be recommended.

Rheumatic persons should inhabit dry, warm dwelling-houses, built on a dry subsoil, and protected from inclement winds. When their means permit, it is desirable they should pass the winter in the south, in resorts which have a warm, dry, and equable climate.

CHRONIC MUSCULAR RHEUMATISM.

Myalgia has been termed a "pseudo-rheumatic" affection, because some authorities doubt its *rheumatic* nature, and are more disposed to regard it as a neuralgia of the sensory nerves of the muscles. What is certain is that it often occurs in persons subject to chronic articular rheumatism, and that it can constantly be traced to the same etiological factors—viz. exposure to cold and wet, and especially to exposure after fatigue. We do not consider it correct to group with these "rheumatic" myalgic attacks, as some authors do, those conditions of mere muscular aching or stiffness which will almost always follow any unwonted and protracted movements of certain sets of muscles; as the stiffness or backache which follows the first resumption of horse exercise, or a long and shaky railway journey in a fixed or cramped position of the body. These painful conditions disappear after a few hours' rest in the recumbent position; but rheumatic myalgias require much the same treatment as the analogous joint affections. Persons who inherit the rheumatic or gouty constitution are well known to be especially prone to such attacks. The chief symptom is **pain,** usually limited to a certain particular set of muscles, although in some cases it will be more generalised. The pain is rarely accompanied by fever, and varies very much in intensity and duration. It is often excited or aggravated by particular movements, and it is relieved by *firm* pressure. It may disappear in a few days, or it may continue, with varying severity, for some weeks, and it is very prone to recurrence. One of the most painful and remarkable of these affections is that known as **lumbago.** It is remarkable because of the often extreme *suddenness* of its onset, and the occasional severity of the pain. A person is stooping to pick up some object on the ground, or to open a drawer, or is making some slight effort of a like kind, when he is suddenly seized with a severe pain in the muscles of the loins, which may completely incapacitate him for some days, and make it impossible for him even to turn over, or to lift himself in bed. This form is most commonly observed in men at or after middle age. Another form met with most frequently in young people is an affection of the muscles of one side of the neck and termed **torticollis,** or *stiff neck,* as the head is held constantly to one side in a fixed position; or the muscles on one side of the chest may be affected—the pectoralis major, the serratus magnus, and the intercostals—causing the respiratory or other movements of the chest to be painful. This is termed **pleurodynia.** Muscular groups in other localities may be similarly affected.

The treatment of these forms of rheumatism *when chronic* is determined by much the same principles as those which apply to chronic articular rheumatism; but attacks of myalgia frequently follow a much more acute course, and we therefore look to obtaining a more immediate result from treatment. In these acute forms the treatment should be both *local* and general.

It is needless to say the painful muscles must be rested. Repose in bed is an important element in promoting a rapid cure. In pleurodynia this rest may be made more complete by controlling the thoracic respiratory movements on the affected side, by applying two or three broad strips of adhesive plaster firmly round the chest. *Dry heat* is a very efficacious remedy, and in cases of lumbago is best applied by covering the loins with a layer of flannel and passing a hot flat iron over it; or a large mustard plaster may be applied; or brisk friction with turpentine liniment, and then a thick layer of cotton wool made as hot as possible, applied, and fixed with a flannel bandage, is an excellent remedy. Dry-cupping is advocated by some physicians. Other measures suited to an acute attack are hot baths or fomentations, followed by a dry hot pack; or a hot *vapour* or Turkish bath, with shampooing of the painful muscles. If the pain is strictly localised and limited, the application of the mixed belladonna and chloroform liniments (equal parts) often affords immediate relief. It should be applied on lint saturated with it, and over this a layer of oil silk should be placed, then some cotton wool, and finally a flannel bandage. Applied in this manner it will be found to act as a powerful revulsive as well as anodyne. Fagge found the local application of methyl-chloride on lint remarkably efficient in relieving a severe case of lumbago.

Internal treatment is also useful in these acute cases, and, if seen at the very onset, diaphoretics answer remarkably well. One of the best is a draught composed of 20 grains of salicin (or sodium salicylate), 12 grains of Dover's powder, a dram of spirits of nitrous ether, half an ounce of solution of ammonium acetate, made up to two ounces with camphor water. This taken at bed-time will usually produce profuse perspiration and complete relief of the pain. The patient should, however, be kept in bed the whole of the next day at least, and he should take salicin or sodium salicylate twice daily for a week or more. There can be no doubt of the great value of the salicylates in these cases. Should the urine be loaded with lithates, some alkali such as 30 grains of potassium citrate, or 20 grains of potassium bicarbonate should be given with each dose of the salicylate. The salicylate of cinchonidine has been warmly praised by some American practitioners. It is given in capsules or in tabloids in doses of 2 to 5 grains three or four times a day. Ammonium chloride is a favourite remedy with some practitioners, but we have not found it so efficacious as the preceding. When the pain is very intense it may be necessary to give a hypodermic injection of morphine ($\frac{1}{4}$ gr.) and atropine ($\frac{1}{60}$ gr.).

In chronic and less acute cases other remedies may be needed. Various local measures have been advocated. Blisters, the application of the constant current, Paquelin's cautery, acupuncture, stroking and kneading the painful muscles, a course of thermal baths, in lingering cases—each of these measures has in its turn been found very useful. It is desirable in these chronic cases to seek for any constitutional or diathetic indication for treatment. In distinctly gouty cases colchicum, potassium iodide, sodium salicylate, and alkaline-aperient waters, together with a carefully restricted diet, may prove curative. In the more purely rheumatic cases guaiacum and sulphur are valuable remedies. In anæmic and asthenic forms we may get excellent results from full doses of iron, arsenic, or quinine combined with strychnine, or nux vomica. As preventive measures, warm clothing, the avoidance of over-exertion and fatigue, and removal from a damp and cold locality to a dry and warm one, obviously suggest themselves.

ARTHRITIS DEFORMANS. OSTEO-ARTHRITIS. RHEUMATOID ARTHRITIS.

This curious disease, long regarded as a gouty or rheumatic affection, and commonly termed "rheumatic gout," differs in its anatomical characters, its causation and its course and results, from both gout and rheumatism. It differs from gout in the absence of uratic deposits in the joints, and from rheumatism by the presence of extensive structural lesions, particularly in the form of erosions of the cartilages; disappearance of the cartilage leaves the ends of the bones bare, and these become smooth, dense and eburnated: irregular bony nodules (osteophytes) often develop at the margins of the articular surfaces, and spreading to the capsule of the joint and other fibrous attachments, finally produce complete fixation and immobility of the articulation. The articular ends of the bones often increase in size (*hyperostosis*), but in old and very chronic cases the heads of the bones may atrophy.

Great deformity often results from these changes, and atrophy of the muscles may be extreme.

A particular form (*Heberden's nodosities*) specially affects the distal phalanges of the fingers, and *small hard nodules* appear at the sides. These are often wrongly regarded as gouty. In such cases (more commonly in women) the larger joints are usually spared. *Acute* and *chronic* progressive forms have been described. The *acute* form affects many joints simultaneously, is attended with a certain amount of fever, and is apt to be mistaken for subacute rheumatism. The *chronic* form is the most common. The *symptoms* of this form consist of pain and swelling affecting certain joints symmetrically, and attacking usually those of the hands first, then the knees and feet, and finally, in extreme cases, nearly all the joints of the body. The pain may be but slight, or it may be very great, especially at night. Crepitation or grating can usually be felt on grasping the joints. In advanced stages, considerable muscular atrophy, and contraction and fixation of joints, lead to extreme deformity and helplessness. Dr. Spender, of Bath, mentions, in what he terms the "quick" form, the occurrence of a rapid high-tension pulse, from 90 to 100, and in some rare instances rising even to 120 or 140.* A spotty or patchy pigmentation of the skin is also described by him as of frequent occurrence. Another phenomenon, often noticed in these cases, is profuse sweating or constant dampness of the surface, especially of the palms of the hands.

In some fortunate cases, after two or three joints have been attacked, the disease becomes arrested; and in the majority, the disease reaches a quiescent stage, in which, although there may be much crippling and deformity, there is freedom from pain, and the general health remains fairly good.

The causation and pathology of this disease are obscure. Spender advances observations which he believes point to a neurosal origin, a view which is shared by Ord. It is remarkably more common in women than in men, and it certainly appears to be connected in many cases with nervous disturbances or with conditions which depress the general health. Ovarian and uterine disease, and the climacteric period, have been regarded by some observers as having a causal relation to this affection. Prolonged anxiety, shock, traumatism, a life of hard work and over-exertion, exposure to cold and damp (as depressing agents), have all been invoked as etiological factors in the production of this disease.

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* "Osteo-Arthritis," p. 6.

It is important, from a therapeutic point of view, to note the apparent dependence of this disease on low, depressed states of health and defective nutrition, as well as on local irritation from over-exertion of certain joints.

Authorities differ greatly as to the curability or remediability of this affection, and this is not so much to be wondered at, when we note that many writers confound together cases of this disease, and cases of simple chronic articular rheumatism, the latter being a malady far more amenable to remedial and curative treatment.

When we read that "in very chronic cases it is sometimes astonishing to observe the good which may follow simple passive movements of the affected joints, and by this procedure deformity, pain, stiffness and anchylosis may disappear, even in bed-ridden patients,"* it is quite clear the author cannot be referring to cases of osteo-arthritis, as the *characteristic* anatomical changes in the "anchylosed" joints would render such results from such treatment quite impossible.

Osler, on the other hand, remarks that this is "an incurable disease. . . . The best that can be hoped for is a gradual arrest." Dujardin-Beaumetz also observes, "nearly all our efforts are powerless to arrest the progressive and invading course of the lesions of this form of rheumatism."† Prof. James Stewart is more hopeful, and while he admits that, "if the joint changes have been marked, we cannot expect to influence them to any extent," yet, if the disease is "recognised early and properly managed, it may not only be arrested, but practically cured."‡

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* Whitla's "Dictionary of Treatment," p. 765.

† "Clinique Thérapeutique," vol. iii. p. 476.

‡ Hare's "System of Practical Therapeutics," vol. i. p. 982.

Great differences of opinion are also encountered, and probably for the same reasons, as to the value of hot baths in this disease; some claim quite brilliant results from thermal treatment, but we have observed that Metzger, of Wiesbaden, who must have had an altogether exceptionally large experience in this matter, strongly cautions patients with the nodular (digital) form against submitting to treatment by hot baths for fear of aggravating the disease; and, we imagine, most practitioners must have met with a considerable number of such cases that have been made distinctly worse by treatment at thermal baths.

Spender, of Bath, says "a joint, big or small, wrecked by osteo-arthritic disease is the despair of medical art, according to our present knowledge." *

It is, however, extremely difficult to ascertain, from the somewhat vague and general statements of Spender, to what extent he has obtained actual and permanent amelioration by thermal methods, even in its application to the "*early*" treatment of osteo-arthritis which he appears to advocate. He asks the question, "Is there any early path of safety and success?" but we are unable to discover in what follows any *direct* answer to his own question. He seems, however, to positively repudiate thermal treatment in all advanced stages, when anchylosis has occurred.

Massage, if practised too energetically and vigorously, as is sometimes recommended, will also aggravate certain cases; and it is most important, when massage is prescribed for these patients, that we should be careful to have it understood that it is to be of the gentlest possible kind, and applied tentatively. Massage of the *muscles*, however, is often of great service in promoting their nutrition and preventing atrophy and retraction. Hutchinson and others have pointed out that occasionally changes of a truly gouty or rheumatic character are found co-existing with osteo-arthritis in the same patient, and sometimes in the same joint, and we may conclude that the cases especially benefited by thermal treatment are those which have affinities with chronic gout and rheumatism.

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* "Osteo-Arthritis," p. 36.

On the other hand, cases frequently appear in families with a marked tendency to tuberculosis, and these require a different line of treatment to the preceding. It is necessary, therefore, in considering the most appropriate treatment of these cases, to investigate carefully their mode of origin, and the constitutional morbid tendencies existing in the patient's family.

Professor Stewart, who considers that many cases of this disease are curable, if taken in hand early, formulates the two following indications for treatment:—1st, To remove any causes of debility; and 2nd, To increase the resisting powers of the organism; to which we would add a 3rd, To allay any inflammatory action *still existing* in the joints.

Taking the latter indication first, we should see no objection to a careful application, in early stages of the disease, of warm baths of a temperature not exceeding 90° F., of not more than fifteen minutes in duration, and not taken more frequently than on alternate days. Together with the bath a light douche may be applied to the larger joints, and gentle massage or passive movements should be employed, chiefly with the view of preventing those morbid changes which lead to the fixation of the joints. What we would especially urge is gentle and tentative treatment *at first* in all cases, and that massage and douches are rarely applicable unless the joints are in a quiescent state. In selecting a bath we should be guided by the desire to find, at the same time, a warm, dry, sunny and agreeable residence, where the patient could be much in the open air and in the sunshine. The warmth of Aix-les-Bains is one of its great advantages in the treatment of these cases; and Ragatz, in Switzerland, has also many claims to consideration. Wildbad and Baden-Baden are pleasant places, with excellent bathing arrangements, but they are not so warm and dry as the preceding. Bath and Buxton, in England, are suitable, but both places leave much to be desired in regard to climatic conditions. Treatment at Woodhall Spa has been found serviceable in some cases. *Daily sponging the joints* affected with warm water *at home, with gentle massage, is as useful in some cases* as removal to a bathing resort. We must not expect very great benefit from *electricity* in these cases. Erb, who has had a vast experience, does not pretend to have made any cures, but he considers he has occasionally improved the general nutrition as well as the local trouble. He applies the continuous current to the spinal cord for from ten to fifteen minutes at a sitting, to the *cervical* region when the upper extremities, and to the *lumbar* region when the lower extremities are chiefly affected; and a continuation of the treatment for *several months* is advocated! Steavenson applied electric baths in this disease, and, he thought, with some benefit. Spender's experience at Bath, however, leads him to the conclusion that, "if the continuous electric current can ever do good, it is only on the very dawn of troubles"; faradisation and galvanism may, however, help the nutrition of the wasted muscles.

Direct counter-irritation is an expedient of doubtful efficacy; it may relieve some cases, but it aggravates others. Our own experience coincides with that of Spender, who recommends sponging with water as hot as can be borne; but even this simple method must be watched carefully lest increased activity of the disease be thereby excited.

We have found benefit from the application of *iodine* paint, *not* directly over the affected joint, but *between* the affected digital joints, and an inch or two above and below the large joints of the limbs. We also agree fully with Spender's advice that, if a blister be applied, it should "be always on the cardiac side of the joint," and that the blistered surface should be allowed to heal immediately.

Gentle friction of the joints with some mildly stimulating liniment, together with gentle passive movements, applied twice daily, will be often found as useful a local measure as any. After bathing the joints with hot water, the following liniment may be used :—

℞ Ol. pini sylvestris	½ oz.
Tinct. iodi	½ oz.
Linim. saponis	ad 4 oz.

M. f. linim.

If there is much pain in the joints, ½ an ounce of laudanum may be added to the above. If the joints are hot and swollen, as well as painful, the patient had better be kept at rest in bed for a time, and the joints may be rendered motionless by suitably applied splints. Cold compresses, if they are grateful to the patient, may at the same time be employed.

Next as to the value of internal medicinal treatment. The utility of *salicylates* in this malady seems to be restricted to the acute, painful exacerbations. The sodium salicylate, in full doses, will often be found to alleviate greatly the pain and swelling of the joints, as it does in acute rheumatism. Antipyrin has been recommended by Dujardin-Beaumetz to relieve pain under the same circumstances. Spender recommends a nightly dose of chloral, 12 to 24 grains, to relieve the nocturnal pain and sleeplessness. Morphine should be withheld until its use becomes a necessity. *Iodine* has been found useful, internally, by many. Lasègue advocated its employment in full doses; he gave the tincture. It may be tried in 10-minim doses thrice daily in a wineglassful of syrup and water; others prefer potassium iodide, 5 to 15 grains thrice a day. We agree with Garrod in preferring the iodide of iron. A teaspoonful of the syrup may be given after meals three times a day.

The use of **tonics** responds to the chief indications formulated for the treatment of this disease, and of these *arsenic* is of special value. It is well to give it in combination with iron, $\frac{1}{24}$ to $\frac{1}{12}$ of a grain of sodium arseniate, with a dram of syrup of the iodide of iron, or with 10 grains of the citrate of iron in an ounce of water may be given after each meal thrice daily. *Cod-liver oil* is also of great service, and Spender thinks the disease may be checked in its earliest stage by this remedy alone. It should be given in small doses at first, and gradually increased till the patient is taking two or three tablespoonfuls daily. Quinine is very useful in sub-febrile cases, and, combined with belladonna and strychnine, is serviceable in checking the tendency to perspiration. The following is a good combination :—

℞ Quininæ sulphatis	36 grains.
Strychninæ sulph.	1 grain.
Extr. belladonnæ	6 grains.
Syrupi	q. s.
M. et divide in pil. 24.	One three times a day.

Dietetic and *hygienic* treatment are of much importance. The diet should be as generous and varied as is consistent with the avoidance of dyspeptic troubles. Animal food and fats should be freely partaken of, and a certain moderate amount of sound wine or beer may be permitted, unless there is a tendency to acute exacerbation of the joint affections, when it will be best to avoid alcoholic drinks altogether. Exercise in the open air should be encouraged—riding, driving, or walking, as is best suited to the individual case. It is of the greatest importance that all risks of chill should be avoided, and as these patients are prone to perspire freely they should not only clothe warmly, but they should wear some absorbent material, such as flannel, next the skin. They should avoid exposing themselves to damp, cold winds, and they ought to live in warm, dry houses built on a well-drained subsoil. *Climate* is of immense curative value, and if a patient can, at the very onset of the malady, be removed to a warm, dry, equable climate, it affords him the very best possible chance of cure. Indeed, when benefit follows from thermal treatment it is often largely due to the change of climate and scene, the escape from daily worries, the life in the open air, and the judicious regulation of the diet, which can be found at a well-selected spa.

ADDITIONAL FORMULÆ.

Mixture for rheumatism.

℞ Potassii iodidi, 2 drams.
Sodii salicylat., 1 dram.
Syrupi simp., 1 oz.
Aquæ menthæ pip. ad 6 oz.

M. f. mist. A tablespoonful twice or thrice daily. (*Dujardin-Beaumetz.*)

Mixture for chronic rheumatism.

℞ Sodii iodidi, 2 drams.
Sodii bicarb., 4 drams.
Potassii bicarb., 1 oz.
Liquoris arsenicalis, 1½ dram.
Dec. sarzæ comp. ad 20 oz.

M. f. mist. A small tablespoonful in a claret-glassful of effervescing potash-water three times a day after meals. (*Whitla.*)

Mixture for chronic rheumatism.

℞ Pulv. guaiaci resinæ, 1 dram.
Potassii iodidi, 1 dram.
Tinct. colchici sem., 3 drams.
Syrupi, 2 oz.
Aquæ cinnam. ad 6 oz.

M. f. mist. A dessertspoonful to a tablespoonful twice daily. (*Philadelphia Hospitals.*)

Anti-rheumatic mixture.

℞ Sodii salicylat., 3 drams.
Aquæ laurocerasi, 1 oz.
Spr. vini rect., ½ oz.
Syrupi simp., 1 oz.
Aquæ ad 6 oz.

M. f. mist. A tablespoonful twice to five times daily. (*Dujardin-Beaumetz.*)

Pills for chronic rheumatism.

℞ Acidi arseniosi, 1½ grain.
Pulv. guaiaci, 1½ dram.
Pulv. capsici, 15 grains.
Pil. aloes et asafœtida, 1½ dr.

M. et divide in pil. 60. One three times a day. (*Fothergill.*)

Confection for chronic rheumatism.

℞ Pulv. guaiaci resinæ, 3 drams.
Pulv. rhei, 2 drams.
Potassii tartratis acidæ, 5 drs.
Sulphuris sublim., 10 drams.
Pulv. myristicæ, 60 grains.
Mellis, q.s.

Ut f. confectio. About half a small teaspoonful night and morning. (*Fernandez.*)

Anti-rheumatic syrup.

Take of
Sarsaparilla, cut and bruised, 2 oz.
Guaiacum chips, 2 oz.
Water, 4 pints.

Boil down to 16 oz., and add 32 oz. of sugar.

Next, take of
Extract of opium, 10 grains.
Resin of guaiacum, 4 drams.
Carbonate of potash, 3 drms.
Tinct. of colchicum, 2½ drms.
Essence of lemon, 2 drops.

Rub these together, and add little by little to above syrup when cold, and strain. Half a teaspoonful or a teaspoonful for a dose. (*Dubois.*)

Liniment for muscular rheumatism.

℞ Chloroformi, 1 oz.
Ol. olivæ, 1 oz.

M. f. linim. To be rubbed over the painful regions.
(*Bamberger.*)

Liniment for chronic rheumatism.

℞ Liq. ammoniæ, ½ oz.
Ol. terebinthinæ, ½ oz.
Ol. olivæ, 1 oz.
Ol. limonis, ½ dram.

M. f. linim.
(*Copland.*)

Another.

℞ Olei cajuputi, 2 drams.
Tinct. opii, 2 drams.
Olei terebinth., ½ oz.
Linimenti ammoniæ, 1 oz.

M. f. linim. (*Fuller.*

Liniment for chronic rheumatism.

℞ Tinct. aconiti, 2 drams.
Ol. terebinth., 1 to 2 oz.
Tinct. opii, 1 oz.
Lin. saponis ad 6 oz.

M. f. linim. To be used three times a day. (*Hare.*)

Ointment for chronic rheumatism.

℞ Veratrinæ, 1 dram.
Hydrarg. protiodidi, 1 dram.
Ung. petrolei, 1 oz.

M. f. ung. To be applied over the joints. (*Hare.*)

CHAPTER III.

THE TREATMENT OF GOUT.

Phenomena of an Attack of Acute Gout—Relation of Uratic Deposits to Articular Gout- Other Gouty Lesions—Cardio-Vascular and Renal Changes — Neuralgic and Cutaneous Affections—Blood State in Gout—How are the Phenomena of Irregular Gout produced?—"Uric Acid does not cover the whole Field of Gout"—Sir William Roberts's Observations—Criticism—Etiology of Gout—Gout a Disorder of Retrograde Metabolism—*Indications for Treatment*—Value of Colchicum—Of Salicylates—Of Guaiacum—Of Potassium Iodide—Of Alkalies—Clinical testimony to their efficacy—Lithium Salts and Piperazine—Magnesium Salts—Mineral Waters in Gout—Vichy, Carlsbad—Sodium Chloride Springs—Lime Springs—Indifferent Thermal and Sulphur Springs—Value of Water as an Eliminant and Solvent—Usefulness of Hot Baths—*Treatment of an Attack of Acute Gout*—General and Local—Treatment of Chronic Forms—Pistoja Powders—*Dietetic and Regiminal* Treatment. Additional Formulæ.

In order to be able to discuss, with advantage, the treatment of gout, we must first consider, as briefly, however, as possible, its chief clinical manifestations and its pathological nature.

The clinical characters of an attack of **acute gout** are the following:—Its onset is sudden, often in the night, and its seat is usually the ball of the great toe, or it may attack the ankle, heel, or instep. The part attacked, at first, feels somewhat hot and painful, and the pain increases quickly in severity until it becomes intense and almost unbearable; the tenderness is also exquisite and the patient cannot endure even the contact of the bed-clothes. Soon there is some fever with shivering and chilliness, and the temperature may rise to 102° to 103°. The pain after a few hours often remits and is less severe. The veins around the painful joint first appear swollen, and shortly the whole joint becomes swollen, tense, shining, and of a deep red colour. The subcutaneous tissues are œdematous and pit on pressure. For the next few days there are usually evening exacerbations and morning remissions, and it is not uncommon for the other foot to be attacked in precisely the same manner. The duration of the attack is variable; it may be over in a few days, or it may be composed of a series of minor and irregular paroxysms, which may incapacitate the patient for many weeks. The skin desquamates as the swelling subsides.

An attack of acute gout is commonly preceded by some troubles of digestion—acidity, flatulence, loss of appetite, constipation, and scanty, high-coloured urine. After the attack the patient not infrequently feels much better than he has done for some time. The attacks are prone to occur at irregular intervals, their frequency often being determined by the mode of life of the patient; but in some instances, whatever care the patient may take, the attacks return with increasing rapidity, and finally he is left with joints permanently crippled, deformed and disabled by gouty infiltrations and deposits.

It must, however, be remembered that, nowadays, gout does not appear so frequently in this acute form, and the joint affection is often slow in developing, and a good deal of minor uneasiness in the part may be for some time complained of, before the characteristic acute swelling, redness, and tenderness appear.

Although the great-toe joint is usually the first to be attacked, other joints generally suffer, especially the smaller ones, the digital joints, and the ankles and wrists.

It is believed that these joint affections are dependent on the precipitation and deposit of sodium biurate crystals in the cartilages, ligaments, synovial membranes, bursæ, and other structures forming part of, or in proximity to, the articulation. In some of the most distressing forms of *chronic* gout, the joints of the fingers, and less frequently those of the toes, become surrounded by massive deposits of sodium biurate (*tophi*) which sometimes slowly ulcerate through the skin; we have seen masses as large as horse-beans thus discharged. Such patients are often by this means rendered absolutely helpless, and cannot even feed or dress themselves. Small deposits of urate of soda are also often observed on the margins of the ears, and occasionally on the inside of the eyelids, on the arches of the palate and elsewhere.

All *gouty* persons do not, however, suffer from such decided manifestations of *articular* gout. They may occasionally have twinges of pain in the joints, and a hot condition of the hands and feet, and perhaps a little thickening around some of the digital articulations; but they are apt to suffer from other disturbances of health, dependent apparently upon blood states, similar to those which, in other persons, give rise to attacks of articular gout. This seems to be doubted by some physicians,* but is fully recognised by others.† The most serious of these are the *cardio-vascular* and *renal* changes that are determined by the gouty state. "The blood tension is persistently high, the vessel walls become stiff, and cardiac and renal changes gradually develop" (*Osler*). The existence of a gouty phlebitis is generally recognised. Headaches, especially migraine, and neuralgias of various nerves, including visceral nerves, not unfrequently arise. Certain skin affections, especially eczema, are also prone to appear in such persons; and many inflammatory disorders of the various mucous membranes are believed to be dependent upon or aggravated by gouty irritation.‡

The blood in chronic gout always contains an excess of uric acid, and Sir William Roberts has shown that uric acid in the blood "passes into solution in the first instance as a quadri-urate," and he infers "that in the *normal* state uric acid is primarily taken up in the system as quadri-urate," and is finally voided in the urine as quadri-urate; and in health its elimination is sufficiently active and complete to avoid its detention or accumulation in excess in the blood. "But in the gouty state this tranquil process is interrupted, either from defective action of the kidneys, or from excessive introduction of urates into the circulation, and the *quadri-urate lingers unduly in the blood and accumulates therein.* The detained quadri-urate circulating in a medium which is rich in sodium carbonate gradually takes up an additional atom of base and is thereby transformed into *biurate*"—a less soluble and less easily secreted compound.

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* See Fagge's "Practice of Medicine," vol. ii. p. 675.

† The late Sir George Paget, when taking part in a discussion on the *Therapeutics of the Uric-acid Diathesis*, which the author opened at the Meeting of the British Medical Association in Dublin in 1887, pointing to a long list of morbid conditions the author had drawn up as dependent on or associated with gout, said in support of the reality of the connection, "I think I may say I have had all of them!"

‡ For a full enumeration of the morbid conditions associated with the gouty state, see the author's paper on "The Therapeutics of the Uric-acid Diathesis." (*British Medical Journal*, Jan. 7 and 14, 1888.)

Sir William Roberts has also considered in his usual interesting manner the question of how uric acid in the blood produces its injurious effects. Are they caused by *mechanical* injury due to the precipitation of crystals of sodium biurate in the tissues? or does uric acid circulating in the blood in a state of solution act as a *true poison?* The phenomena of *regular* articular gout, he thinks, are easily explicable on the *mechanical* view. "The crystalline urates precipitated in the cartilaginous and fibrous structures of the joints necessarily act as foreign bodies; they excite irritation, clog the lymph channels, exercise pressure on the tissue elements, and impede their nutritive operations;" * hence the inflammation, pain, swelling, and subsequent degenerative changes in the joints.

But it is difficult to accept the *mechanical* theory as explaining the phenomena of *irregular* gout. "The visceral disturbances and manifold neuroses which trouble the gouty have not yet been anatomically traced to uratic precipitation." Sir William Roberts sees equal difficulty in adopting the toxic view. He argues that there is no proof that uric acid is poisonous. "The system of the gouty man is at times surcharged with uric acid. On the eve of an outbreak the fluids of his body—in parts, at least—must be impregnated with biurates to saturation; for, of course, no precipitation can occur until this point is reached. Yet, with fluids thus saturated with urates, such persons betray not the slightest sign of poisoning and enjoy complete immunity from symptoms of every kind until overtaken unwarned by the sudden precipitation which provokes the arthritic attack." But this statement, although applicable to those who suffer from attacks of typical acute gout, does not apply to the sufferers from irregular gout. The individual who is prone to attacks of acute arthritic gout rarely, it is true, suffers from the *irregular* non-arthritic form, because, we take it, his other tissues are but slightly sensitive to the gouty poison; whereas the sufferers from *irregular* gout possess tissues peculiarly sensitive to it, which react to the poison and resent its presence, long before it has accumulated in sufficient quantity to be deposited in the joints, or probably to assume a crystalline form. In answer to Sir William Roberts's other argument that "manifestations of irregular gout are so extremely diverse in seat and character that it is hard to believe that they can be produced by one and the same toxic agent," we would point to the familiar and analogous phenomena which attend the toxic action of certain drugs, in certain persons hypersensitive to their action; the smallest dose of quinine will produce an erythematous rash in one, a headache in another, and gastric discomfort in a third. Alcohol will poison one man's motor centres, leaving his intellect scarcely touched, while in another it will obscure his intelligence and leave his motor centres comparatively unaffected. Many other illustrations of this nature might be advanced, so we think this objection is not a valid one. With a more recently expressed opinion of the author we are more entirely in accord—viz. that uric acid does not "cover the whole field of gout," and that "if uric acid were altogether eliminated a pathological entity would still remain and be recognisable as gout."*

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* Croonian Lectures on "Uric-acid Gravel and Gout."

Professor Bouchard has expressed the same opinion. He says, "it has by no means been demonstrated that in gout uric acid is the only or even the chief matter contaminating the fluids . . . many of the chronic lesions of gout are in part composed of or occasioned by precipitated urates; but the disease itself is not due to uricæmia." †

In his Croonian lectures, however, Sir William Roberts argues in favour of the probability that the phenomena of irregular gout may be due to precipitation of crystalline urates in the tissues, "gentle sprinklings sufficient perhaps to cause irritation if the implicated tissue be a sensitive one." Such slight fugitive precipitations falling "upon the membranes of the brain or upon fibrous sheaths of the nerve roots would afford an adequate explanation of the phenomena of irregular gout." The acceptance of this view would dispose of the assumption that uric acid and its compounds are *toxic* and would refer their morbid influence solely to their "sparing solubility in the bodily media" and their consequent proneness to precipitation in the crystalline form.

If this view of the nature and causation of the morbid phenomena of irregular gout be accurate and sufficiently comprehensive, the chief therapeutic indication, when such phenomena were actually present, would be to endeavour to increase the solvent power of the blood and the fluids of the body for crystalline sodium biurate, so that it might be eliminated. But there is good reason to doubt whether the therapeutic indications of the gouty state are so simple as this. Sir William Roberts has conclusively shown that many of the substances given as remedies for gout, in the belief that they promote the holding in solution and thereby prevent the deposition or even favour the re-solution of sodium biurate, cannot so act, and he seems to infer that they cannot be remedies for gout. This inference, however, covers far more ground than the premisses from which it is deduced. Sir William Roberts has since admitted that uric acid "does not cover the whole field of gout," and the error, we imagine, lies not in the conclusion that these substances are remedies for gout, but in the explanation which has been advanced of their mode of action.

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* Report of Proceedings of Medical Chirurgical Society, in *British Medical Journal*, Jan. 14, 1893.

† "Maladies par Ralentissement de la Nutrition." Second edition, p. 264.

The precipitation of crystalline sodium biurate is the ultimate or penultimate manifestation of the morbid state which we call gout; and it may fairly be concluded that those substances which Sir William Roberts asserts must be useless, or even worse than useless, in their effect on these final precipitations, yet influence beneficially the antecedent determinant morbid states, as indeed they have by actual experience been found to do; and as some of these seem to have a remarkable influence over the irregular manifestations of this disease, we may be permitted to believe that they exert their influence over that portion of the "field of gout" which is not covered by uric acid! *

The sodium salts, for instance, which he especially repudiates, may exert their remedial influence by a beneficial action on the gastric, intestinal and hepatic functions, or on the nutritive changes in the tissues, quite irrespective of any direct solvent action on sodium biurate. By their action on the liver they may prevent "the excessive introduction of urates into the circulation," or by their stimulating action on the kidneys they may counteract the tendency to their "unduly lingering in the blood and accumulating therein"; so that their influence may be in the truest

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* Garrod has shown that in gout the alkalinity of the blood is lessened, and he attributed the deposition of the urate of soda to the *diminished alkalinity* of the plasma; but Sir William Roberts contends (Croonian Lectures) that "alkalescence, as such, has no influence whatever on the solubility of sodium biurate."

and best sense *remedial*, inasmuch as they would attack the morbid processes nearer their origin and source.

We have unavoidably gone beyond our limits in our examination of the modern views of the pathological nature of the gouty manifestations; we must now enumerate briefly its known etiological factors. and then pass to the consideration of its therapeutics.

The hereditary character of gout, its tendency to appear in the male much more frequently than in the female, its preference for adult age, though occasionally met with in childhood, its proneness to attack persons who live too freely, and who consume food and stimulants, especially wine and malt liquors, in great quantity, its association with chronic acid dyspepsia, its peculiar prevalence in climates such as that of the British Isles — cold, humid and changeable — its occasional determination by depressing emotions and intellectual strain, and its singular connection with lead intoxication — all these, its chief etiological relations, are well known.

We believe the best guide to the treatment of gout is the acceptance of the fact that it is mainly a **disorder of elimination**—a defect or feebleness in the function or functions of elimination of the waste products of nutrition. This defect may be inherited, and then it appears occasionally in a very intractable form. It may be acquired,-and is then more readily ameliorated and controlled.

We have ventured elsewhere to speak of gout as "disturbed *retrograde* metamorphosis." It can scarcely be a disorder of *constructive* metabolism, for it rarely occurs during growth and development, and in many of those who are prone to its visitations, constructive metabolism is remarkably vigorous, active, and apparently normal. Its comparatively rare occurrence in women, who produce much less nitrogenous waste than men, owing to their less active lives, and who have an additional outlet for waste products in the menstrual flux, further corroborates this view. There is reason, then, for concluding, that in the gouty, the constructive metabolism may be normal, but the **destructive metabolism,** the processes for the removal of waste, are prone to morbid disturbance.

The **general indications** in the **treatment of gout,** then, are, first, to promote *elimination* of waste; and secondly, to prevent *accumulation* of waste. In the management of the *acute* arthritic attacks we have the additional indication to allay local pain and inflammation, and in the chronic joint affections to endeavour to restore the normal mobility of the joints.

We must take a larger view of "the whole field of gout" than that covered by the uric-acid theory, and we must set ourselves free from any domination by *à priori* considerations deduced from experiments outside the human organism.

The appeal to practical therapeutic results is the best test of the probability of any theory put forward in explanation of the phenomena of gout.

It will be convenient, in the first place, to discuss the value of certain of the remedies proposed for the treatment of gout, and subsequently to refer to certain details in the management of the acute attack and of other manifestations.

We will commence with **colchicum.** This remedy has been much discredited of late years, and it had, no doubt, in former times been misused. When attacks of acute arthritic gout were far more common than they now are *over-doses* of colchicum were no doubt often given, and evil results naturally followed. But we shall find that most of those who have had the largest opportunities of forming an opinion of the value of colchicum in gouty affections, are advocates of its use. Garrod has given his verdict in its favour after the most searching and careful examination of its action; and so cautious and sound a practical physician as Sir Thomas Watson not only advocated its use as a curative, but also as a preventive, measure. Graves held the same views. Lecorché, in his valuable and exhaustive treatise on gout, after relating the details of the numerous experimental investigations he has conducted into the action of colchicum, thus sums up: "In concluding this study of the effects of colchicum, we assert, as the outcome of our physiological researches and our clinical observations, that colchicum constitutes the specific *par excellence* for gout; that it may and ought to be used in the treatment of that affection, both in the acute and chronic form."

Professor Bartholow, of Philadelphia, gives one of the best practical accounts of the effects and uses of colchicum that we have met with. "In small doses," he says, "it increases the mucous and glandular secretion of the stomach and intestines, and probably, also, of the liver, kidneys, and skin. . . . It increases the flow of urine, of the solid constituents, as well as of the water, and promotes the cutaneous transpiration. . . . It is indicated when a prompt elimination of waste is required. . . . . . It relieves the pain, diminishes the swelling, and shortens the duration of acute gout. In order to accomplish these results it is not necessary that the more harsh and violent physiological effects of the drug be produced. Sufficient should be given to increase secretion from the skin, the intestinal mucous membrane, and the kidneys, but nausea and vomiting should be avoided. Combination with an alkali increases the therapeutic effect." He adds: "Combined with saline purgatives, it quickly relieves the constipation, hepatic congestion, and headaches of gouty subjects. It is useful in gouty bronchitis; it often relieves neuralgia occurring in gouty constitutions; it relieves by setting up an eliminative process."

This description so entirely agrees with our own observation that we find little to add to it. There has existed some difference of opinion, which experimental tests have failed to settle, as to the action of colchicum on the renal secretion.* Our own opinion is that it acts somewhat differently in different individuals and in different circumstances. Its most constant action is, we believe, on the hepatic secretion. Again and again, when the motions have been pale and clay-coloured from the absence of bile, we have seen a few doses of colchicum restore the natural dark colour due to a proper admixture of that secretion. It seems to act sometimes as a diuretic, and sometimes as a diaphoretic, and, when it acts more especially on the skin, the renal secretion may appear to be diminished by it, and naturally, also, when it causes watery alvine evacuations.

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* Dr. Maclagan, of Hexham, published long ago some observations which showed that the elimination of urea and uric acid in the urine was largely increased by the administration of this drug. (*British Medical Journal*, August 27th, 1887.)

Graves thought, and Lecorché supports the view, that it prevents or checks the formation of uric acid in the system, and this it may do by its decided action on the liver. Our own view is that it acts more or less on all the excretory organs; that it is a stimulant to excretion; and as we regard the gouty constitution as one whose fault is especially a sluggish and imperfect retrograde metamorphosis, and delayed excretion generally, not necessarily of uric acid alone, colchicum is in a special sense its remedy by promoting the elimination of waste products. Lecorché's experiments proved that it diminished the acidity of the urine and decidedly increased the amounts of soda and potash in that secretion.

The prejudice against colchicum has induced Ebstein to make the extraordinary statement, that it is preferable to relieve the pain of the gouty paroxysm by hypodermic injections of morphine. He says they act "quicker, more easily, and with less danger." We join issue with him here. The internal use of opiates in gout we consider, except in exceptional circumstances, undesirable. In a disease of defective elimination we should be giving a drug which depresses in a remarkable manner the function of all the excretory organs but the skin. A very small dose of morphine will, in some gouty constitution, produce clay-coloured alvine evacuations for days.

Colchicum, then, we maintain, is one of the most valuable remedies, when judiciously given, for most of the morbid manifestations of gout, and so far from being always a dangerous vascular depressant we have shown, in our hospital practice, that, in a case of chronic gout with subacute exacerbations, moderate doses of colchicum restored regularity and strength to an irregular and feeble pulse.

Much difference of opinion exists as to the value of the **salicylates** in gout. Professor Germain Sée has asserted that sodium salicylate is the best remedy for gout in its acute or chronic forms. Ebstein remarks that when he has used this salt in acute uratic arthritis, the inflammation has disappeared very quickly from one joint, to reappear immediately in another, even when the administration of the salicylate was continued. Lecorché says he has found it useful in acute gout, though altogether inferior to colchicum; it lessens the pain and the violence of the paroxysms, but in no way shortens the attack. In cases of chronic gout, with tendency to the production of deformities from deposition of urate of soda (tophi) and to constantly recurring subacute attacks, he considers it valuable. Given, he says, in such cases, from time to time, in the intervals of the attacks, in doses of 60 to 80 grains a day, it increases notably the amount of uric acid excreted in the urine, and so eliminates from the blood the excess of urate of soda. In a great number of cases, he asserts, he has been able by its use to (1) prevent attacks; (2) to prevent the formation of anchyloses and to cause already existing stiffness of joints to disappear; and (3) to facilitate the absorption of uratic deposits. To obtain these good results it was necessary "to continue, imperturbably, for months the use of salicylate of soda in doses of 60 to 90 grains daily, only allowing the patient four or five days' interval every twelve to fifteen days, then returning to the medicine with the same regularity." He has found it of "enormous service" in the treatment of gouty asthma, angina pectoris, and cystitis. It should not be employed when there exist evidences of interstitial nephritis. Professor Bouchard * considers it a valuable medicine in the treatment of acute gout, relieving pain and sometimes shortening the attack, but he considers its employment dangerous when there is any tendency to cardiac degeneration or when the kidneys are involved.

Lecorché states he has observed an enormous elevation (*hausse enorme*) of the amounts of urea and uric acid in the urine as the result of the administration of salicylate of sodium; that this elevation usually appears within the first twenty-four hours, but may be delayed for forty-eight or seventy-two hours, and that it lasts for three or four days, when a progressive diminution sets in. He also states that the amount of phosphoric acid increases and diminishes in the same manner and at the same rate.

Dujardin-Beaumetz supports Sée's views as to the value of sodium salicylate in gout, and he considers the differences of opinion that exist on this head are due to the fact that in cases where there is renal "impermeability" its use is dangerous, and that careful observations should be made as to the state of the kidneys before administering it.

Haig advocates the use of sodium salicylate in daily doses of 60 grains. Duckworth admits its efficacy and usefulness, but does not think it likely to supersede colchicum. Whitla has seen most satisfactory results from its administration in acute gout.

We have not much to add to these observations. We consider sodium salicylate a useful alternative remedy, especially in acute and highly febrile attacks in otherwise healthy subjects, and in chronic forms which prove intractable to other remedies.

The *benzoates* of sodium and lithium are now rarely prescribed.

The high commendation given by Garrod to the use of **guaiacum** in chronic articular gout has found but few adherents. "I could relate," he says, "many hundreds of cases in which guaiacum has proved especially valuable; in some its action is almost magical. I have now for twenty years or more employed guaiacum very extensively in the treatment of chronic gout—I believe in some thousands of cases—and there is no remedy of which I can speak so confidently." It is remarkable how little attention has been paid to this recommendation. We have certainly found this drug give great relief to the muscular pains of persons who were undoubtedly subjects of gout.

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* "Maladies par Ralentissement de la Nutrition," p. 316.

A more universally accepted remedy is **iodide of potassium.** Its use in chronic arthritic affections is widespread, but it has its most important applications, we believe, in the less easily recognised degenerative changes dependent on this diathesis. We allude especially to the renal and vascular changes. Iodide of potassium, if long continued in fairly large doses, has a remarkable influence in retarding the progress of those degenerative vascular changes dependent on the gouty constitution, which, if left untreated, sometimes advance with great rapidity.

In cases with albuminuria and well-marked vascular and renal changes we have found iodide of potassium, in daily doses of 15 to 30 grains, continued for a few weeks, and repeated from time to time, of remarkable value in improving the general condition; and we have not infrequently seen the albumen disappear from the urine, or be reduced to a mere trace. How the iodide acts in these cases we are not prepared to say; but it promotes the action of certain of the excretory glands, and sometimes acts as a powerful diuretic. Its influence in promoting the elimination of deposits in the tissues is established by its power of removing lead and mercury from the system in cases of chronic intoxication by these metals. It is necessary to "feel one's way" with regard to dose, some constitutions requiring a much larger one than others. We repeat that iodide of potassium is a valuable remedy, not only in the chronic and subacute arthritic affections of this diathesis, but also in the graver but less *obvious* arterial and renal changes.

The value of **alkalies** in the treatment of gout has been almost universally accepted. But Sir William Roberts* has recently challenged the validity of that opinion, and we must therefore examine this subject fully. "Clinical experience," he says, "on the use of alkalies, speaks with a doubtful voice"; and the hypothesis that by "increasing the alkalescence of the blood, they enhance its solvent power on the material of gouty deposits and thereby delay or prevent their formation," he considers the evidence of his experiments "entirely destroys." "It has," he says, "been conclusively proved that alkalescence, as such, has no influence whatever on the solubility of sodium biurate."

We must, then, either give up the use of alkalies in gout, which we may frankly say we are not disposed to do, or we must find some other explanation of their mode of action, or we must be content to administer them as we do colchicum, without knowing precisely how they act.

But let us see what is the testimony of clinical physicians on this matter. Professor J. Stewart says, "the alkalies promote metabolism and prevent the deposition of uric acid. . . Alkalies are of value in relieving not only the arthritic symptoms present in an acute gouty attack, but they also tend to remove or lessen the amount of uric acid in the blood." † Dujardin-Beaumetz, commenting on the utility of alkaline waters, observes that "they do not act by neutralising an excess of uric acid, but by acting on the *general nutrition*, the functions of which they regulate." ‡ "Alkalies," testifies Professor Whitla, "by forming soluble salts with uric acid, which salts, acting as diuretics, are freely washed out in the urine, cause marked elimination of uric acid, and are the most valuable of gouty remedies." § Professor Bouchard points out that "the alkalies are indispensable to certain acts of disassimilation (what we have termed 'retrograde metamorphosis'); without alkaline bases the organic acids could not be consumed in the economy," and their utility in gout he would refer to their influence in quickening nutritive changes.* "Alkalies," Fagge observes, "are decidedly useful in gout." † Lecorché maintains that "the bicarbonates and the sulphates [he prefers the sodium salts] are *par excellence* the medicines for the gouty diathesis," ‡ and he bases his conclusion upon the influence they exert over the metabolism of nitrogenous substances. "Alkaline waters," says Professor Dieulafoy,§ "are of incontestable efficacy." Niemeyer, while expressing a strong conviction of the value of alkaline waters in gout, is careful to state that his belief is not based on the supposition that they act in any special manner on *uric acid.* ||

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* Croonian Lectures.

† Hare's "System of Practical Therapeutics," vol. i. p. 999.

‡ "Clinique Thérapeutique," vol. iii. p. 512.

§ "Dictionary of Treatment," p. 306.

Sir Thomas Watson, without reference to any theory of uric acid elimination, and supporting a recommendation of Sir H. Halford, advises as a prophylactic remedy that *every day* 15 grains of potassium bicarbonate should be taken with tincture of rhubarb and some light bitter.¶

With this evidence before us, which we could largely increase, we cannot accept the conclusion that "clinical experience on the use of alkalies" in gout "speaks with a doubtful voice." In connection with the use of alkalies in gout, we would venture to advance the following facts:—Firstly, the serum of *healthy* blood is *alkaline;* secondly, the alkalinity of the blood serum is due to the presence of sodium carbonate—"rich in sodium carbonate," Sir William Roberts says; thirdly, the entrance into blood serum of uric acid leads, according to the same authority, to the

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* "Maladies par Ralentissement de la Nutrition."

† "Practice of Medicine," vol. ii. p. 684.

‡ "Traité de la Goutte," p. 554.

§ "Pathologie Interne," tome ii. p. 562.

|| "Practice of Medicine," vol. ii. p. 504.

¶ "Principles and Practice of Medicine," vol. ii. p. 773.

formation in the first place of a quadri-urate (of sodium), and this must be at the expense of the sodium-carbonate of the blood. Then the "quadri-urate gradually takes up an additional atom of base, and is thereby converted into biurate," thus depriving the blood serum of more of its alkali (sodium). We thus see how the addition of an abnormal amount of uric acid to the blood serum robs it of its alkalinity, and renders it therefore no longer "rich in sodium carbonate." Fourthly, there is good reason for believing that the maintenance of the normal alkalinity of the blood serum has an important relation to the maintenance of normal nutritive changes, and therefore, probably, an important bearing on that part of the "field of gout" not covered by uric acid. These considerations as to the blood conditions in gout seem to us to afford a scientific and rational explanation of the observed usefulness of alkalies in this disease; while their remedial influence on coincident morbid disturbances of the gastric and hepatic functions must have no small share in the good effects observed to follow their administration. It is worthy of note that the majority of French authors, who have not fallen so much under the influence of Garrod's teaching, and who have regarded the value of alkalies in gout to depend rather on their general influence on metabolism than on their special solvent influence on uric acid, have mostly advocated the use of the sodium salts, while those who have been dominated with the idea of exerting a solvent action on uric acid have preferred salts of potassium and lithium.

It is further worthy of note that, in spite of all the theoretical denunciations of the use of sodium salts in gout, the gouty, from all quarters of the globe, have resorted, and continue to resort, in steadily increasing numbers, to those Continental springs in which the salts of sodium are overwhelmingly predominant.

As an instance of the confusion that exists in the minds of some of the most eminent authorities on this matter, we would quote an observation on the treatment of gout from a recent text-book: "Potash water, Apollinaris or seltzer water should be taken freely. Waters with the sodium salts should be avoided." Now the chief mineral constituents of both Apollinaris and seltzer waters are *sodium* salts!

What, it appears to us, Sir William Roberts's experiments have overthrown is simply the explanation hitherto advanced of the action of the alkalies as solvents in the blood of sodium biurate; but that they have not disturbed the clinical and practical estimate of their general utility in gout; while Sir William Roberts is himself one of the strongest advocates of their use, for the solution of uric-acid deposits in the renal passages, and for the maintenance of uric acid in solution in the urine.

As to the superiority of lithium salts in gout as promoters of the solubility of sodium biurate, and as tending to prevent the formation of uratic deposits, Sir William Roberts's conclusions are that they have not the slightest effect of this kind; and the same with regard to the much-lauded "piperazine."

"If these bodies," he says, "have any beneficial action in gout, it is certainly not due, as has been supposed, to their solvent action on the material of gouty concretions." *

The value of lithium salts in the treatment of gout has been greatly over-estimated. Although the equivalent of lithium is low, and the necessary dose is small, most of its preparations are far less soluble than those of potash and soda, and we fail to see any decided advantage in being able to give 4 grains of lithium carbonate instead of 8 grains of potassium bicarbonate; and even Garrod does not claim so large a relative superiority as this for the lithium salts. The diuretic effect of potassium bicarbonate is more constant and reliable, especially when given with hot water containing a little milk, which quite conceals its taste. When we are invited to select a mineral water for the treatment of gout, solely and specially because it contains, say, a tenth of a grain of lithium chloride in a pint, we are running the risk of becoming the slaves of fashion.

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* Croonian Lectures.

Ebstein maintains that lithium chloride has no solvent action on uric acid, and that if a mineral water contains the carbonate, in very minute quantities, it becomes wholly converted into chloride in the stomach, and is therefore, as far as the lithium salt is concerned, quite without efficacy.

The superiority of the sodium compounds in dyspeptic states, in gastric and intestinal catarrhs, and in disturbance of the functions of the liver, so common in the subjects of this diathesis, is admitted by Garrod himself. We are convinced, from our own observations, that a *combination* of alkaline salts acts often more efficaciously in removing an acid condition of the fluids, than either alone.

It has been suggested that we have been to blame in allowing the compounds of lime and magnesia to fall into disuse in the treatment of the gouty constitution. Salts of magnesia are found in many of the mineral springs which enjoy a reputation in the treatment of this diathesis, and many gouty patients have testified to the great benefit they have found in frequently taking a dose of Gregory's powder.

The old-fashioned "white mixture" so frequently prescribed for gouty patients is, as is well known, a combination of sulphate and carbonate of magnesia.

Closely connected with the use of alkalies in gout is the employment of **mineral waters.**

There is one thing which strikes one forcibly in approaching this subject, and it is that nearly every kind of mineral water that exists, has been recommended in the treatment of the gouty constitution—the carbonate of soda waters of Vichy, the chloride of sodium springs of Homburg, the sulphate of soda waters of Carlsbad, the lime waters of Contrexéville and Bath, the sulphur waters of Harrogate and Aix, the indifferent thermal waters of Buxton and Gastein, and even the iron waters of St. Moritz; while there are a vast number of other springs, like those of Royat, which base their claim to be considered as remedies for gout upon the salts of lithium they contain.

If each of these springs, so different in composition, is of value in the treatment of gout, we should naturally look for certain conditions common to them all. These are:—1. The quantity of water, more or less pure, taken into the body under regulated conditions daily. 2. The altered mode of life, the regular exercise in the open air, the modified diet, the early hours, the absence of business cares. 3. In many foreign spas there is the drier and hotter Continental climate. 4. The stimulating effect to excretion and "tissue change" which the baths, douches, frictions and manipulations applied at most of them induce.

These are conditions, and not unimportant ones, common to most mineral water cures; and in the "indifferent thermal" springs which are chiefly applied to the relief of the chronic joint affections, deposits, deformities, and loss of muscular power dependent on uratic inflammations, the thermality and modes of application of these hot springs are probably the chief operative agents.

We can only here refer very briefly to the chief of these resorts.

1. Vichy may be taken as the type of purely alkaline waters, its chief and all-important constituent being sodium bicarbonate (Vals, Ems, Neuenahr, Apollinaris are of the same character)..

Durand Fardel after more than forty years' experience at Vichy, satisfied himself that its springs "are extremely efficacious in gout." In gout, he says, it should only be employed in the intervals between the attacks. He considers its good effects to be attributable to the influence of the soda in promoting a normal and regular nutritive metabolism. He denies that it exercises any debilitating influence, as was asserted by Trousseau, unless it is improperly and injudiciously applied.

The cases best suited to Vichy are gouty dyspeptics, fairly vigorous, with a tendency to pass acid urine, with deposits of urates and uric acid.

2. Carlsbad is one of the special resorts of the gouty. Its waters are hot, but of varying temperature, and contain considerable quantities of sodium sulphate, sodium bicarbonate, and sodium chloride. It is a common error to regard these waters as very "lowering" purgative springs. They are no doubt aperient, but when properly administered only gently so, and it is often found necessary at Carlsbad to add a teaspoonful of the Carlsbad salts to the first glass of the water to ensure an action of the bowels. These springs have a remarkable action on the liver, and they have been especially utilised in the treatment of the gouty constitution when this is associated with hepatic congestion, hæmorrhoids, and "abdominal plethora." Dr. Kraus asserts that he has found its waters "indicated in all cases of gout," and their use "attended with the most remarkable results." He specifies, however, those cases in which vascular and renal degenerations have set in, as well as the weak and debilitated, as requiring very careful supervision. We should not ourselves advise any regular mineral course in such cases; it is exceedingly undesirable to surcharge with water, even for a short time, the vascular system when it is the subject of degenerative changes. Dr. Kraus states that *recent* gouty deposits "will generally disappear during or soon after the use of the Carlsbad waters, but that they have no influence over chronic indurations." We regard the Carlsbad course, when accompanied as it is with the employment of the hot mineral or mud baths, as exceedingly valuable in promoting elimination by all the chief excretory organs of the body, skin, kidneys, and intestines, and that in this way it stimulates normal nutritive metabolism and promotes the discharge of the waste products of imperfect metamorphosis.

3. We have a large and important group of springs in which the chlorides, and especially the

chloride of sodium, are the chief ingredients. Leamington in England, Homburg and Kissingen on the Continent, may be taken as examples of cold springs of this class; Nauheim and Wiesbaden of hot ones. The hot springs of this class are generally admitted to be valuable in chronic rheumatic conditions, but there is some hesitation in admitting their utility in gouty states. In the treatment of gouty articular deposits, Ebstein and others estimate highly the hot springs of Wiesbaden, applied as baths, and also drunk hot. Ebstein quotes the experiments of Pfeiffer to show that the water of Wiesbaden greatly increases the renal excretion and the quantity of urea excreted.

Homburg and Kissingen are especially applicable to chronic dyspepsias, to gastric catarrhs in gouty persons, whose gout, however, does not assume a very serious aspect. The waters are diuretic and slightly aperient; they are considered to "promote tissue change," to promote elimination, to check the tendency to obesity, and to "ward off" the more serious gouty affections.

4. The most difficult waters to comprehend are those earthy waters containing chiefly sulphate and carbonate of lime, like the cold springs of Contrexéville. We have visited personally most of the important spas of Europe, and have remarked that the springs at nearly all of them are administered by the physicians who practise there in moderate and sometimes in quite small quantities. But it is quite otherwise at Contrexéville; there the glasses hold each about twelve ounces, and as many as eighteen glasses a day are occasionally ordered by the physicians, and over-zealous patients will occasionally add half-a-dozen more on their own account!

One of the objects of passing this large quantity of fluid through the urinary passages is, no doubt, to mechanically dislodge and carry away calculous deposits lodged in the kidneys; and it is indeed remarkable the success which frequently attends these efforts. But is it possible that this water exercises any solvent effect on the surface of these calculi, or on uratic deposits in the system? We were assured by the able physicians in practice there that in gouty persons large quantities of uric acid are excreted during, and sometimes for a long time after, the course.

Another interesting point about the use of these sulphate of lime waters is the decidedly purging effect they often exercise at Contrexéville. This is at once apparent by the abundant provision made for such accidents. Is this the result of the mere overflow and passage through the intestines of undigested water, as is maintained by practitioners at rival springs? or is it that this large quantity of water conveyed (when taken, as it is, in the morning fasting) immediately through the hepatic portal circulation stimulates a free secretion of an abundance of thin, very fluid bile, which acts as a quick purge when it reaches the intestine? or is it that both these events happen? Several patients who were trustworthy observers assured us that their evacuations were distinctly "bilious," and not merely "watery."

5. The local treatment of gouty deposits, of gouty deformities, and gouty neuralgias, often attended with such marked advantage at such thermal springs as Buxton, Gastein, Wildbad, Bath, and Aix, owes much of its success, no doubt, to the thermality of those springs, and especially to the frictions, douches, and manipulations there employed. And in the case of the indifferent springs, the ingestion of a certain amount of warm water daily, acts, no doubt, as a useful solvent and eliminant.

6. The sulphur springs, as those of Aix and Harrogate, find their appropriate application in those numerous instances of the gouty constitution which are accompanied with cutaneous eruptions, as psoriasis and eczema.

But one of the chief advantages to be derived from a course of mineral waters is, as we have already suggested, the quantity of that most important eliminative agent, **water,** that is ingested, and it is not necessary to resort to a mineral spring in order to consume an adequate quantity of this valuable solvent. No remedy is more valuable and important in the treatment of the gouty diathesis, than the regular consumption of a considerable quantity of pure water and preferably **hot water.**

As a diluent and solvent of renal excrementitious substances it is most useful, while in its rapid passage through the system it must dissolve and carry away waste matters from the blood and tissues. When drunk at a higher temperature than that of the blood the effect of this hot water flowing through the hepatic portal circulation is to stimulate the functions of the liver cells and promote biliary excretion. It thus responds fully to the foremost indication in the treatment of gout—*i.e.* "to promote the elimination of waste"; while, by temporarily diluting the blood, it must favour the solution of uratic deposits and prevent their precipitation.

The subjects of this diathesis would do well to drink daily a teacupful of hot water on first rising in the morning, another half-an-hour before dinner, and a third the last thing at night.

In combining the regular application of hot baths of some duration, fifteen to thirty minutes, with the ingestion of hot water, as is the practice at most thermal stations, a powerful appeal is made to another *eliminative* organ—viz. the *skin;* and a further step is taken in carrying out the indication for evacuant treatment

In short, all the measures that have been found by experience to be of value in the treatment of gout are directed to promote and hasten the complete metabolism of nutritive waste, and support the view that gout is essentially a morbid disturbance of "retrograde metamorphosis."

The preceding considerations have chiefly had reference to the remedial treatment of the constitutional state in the gouty, and of the more chronic manifestations of this disease; we must now consider briefly the treatment of an attack of **acute articular gout,** such as we have described at the commencement of this chapter. We have said that the gouty subject often feels better after an acute attack of regular articular gout, than he may have done for some time previously, and an acute outbreak of gout in the great toe has occasionally been contemplated with a certain amount of satisfaction. "A gouty man, tormented with symptoms of irregular gout, is relieved by a regular arthritic attack . . . . . this arises from the complete, or approximately complete, precipitation of the urates floating in his blood and lymph into the structures of the joints. The urates are thereby almost as effectually removed from the vital fluids as if they were eliminated by the kidneys" (*Sir W. Roberts*).

Ought we, then, to interfere actively in treating an acute attack? If our idea, in treating such an attack, be to redissolve the precipitated urates, and so restore them to the circulation, we should, unless we could at the same time ensure their elimination by the kidneys, apparently be rendering our patient a doubtful service, if the foregoing view of the nature of the articular attack be correct. No doubt we should pursue mainly an eliminative treatment, and afford further aid to the organism to throw off peccant substances in the blood that have led to the acute joint attack, and so we may prevent an excessive injury to the articular structures originally attacked, or obviate the involvement of more joints. For this reason we should avoid, if possible, the internal use of opiates because of their tendency to check elimination. We must, however, especially have regard to the constitutional state of the patient, for treatment that would be most appropriate in a plethoric, robust subject might be wholly unsuited to a feeble, debilitated person, worn out, perhaps, by repeated acute attacks, or suffering at the same time from arterial and renal changes.

In a robust patient, with an uncomplicated attack of acute articular gout, we should administer moderate doses of colchicum in combination with an alkaline saline aperient. The following formula is a good one for the purpose:—

℞ Magnesii sulphatis	1½ oz.
Magnesiæ levis	2 drams.
Potassii citratis	4 „
Tinct. sem. colchici	2 „
Aquæ carui	ad 8 oz.

M. f. mist. Two tablespoonfuls, with two of hot water, every three hours until the bowels have been freely relieved.

After the bowels have been freely acted upon, the sulphate of magnesia should be omitted, and when the joint pain is to a great extent relieved the mixture should be given every six instead of every three hours; it will, however, be found useful to continue to give a dose of the original mixture every morning, to maintain an aperient effect so long as the acute attack lasts.

If there should appear to be any reason for avoiding the use of colchicum, or should there be any counter-indication to the employment of aperients, such as the co-existence of an intestinal flux, we may use the following mixture of salicylates:—

℞ Sodii salicylatis	2 drams.
Lithii salicylatis	40 grains.
Potassii citratis	4 drams.
Tinct. zingib....	20 minims.
Aquæ cinnam.	ad 8 oz.

M. f. mist. Two tablespoonfuls every two or three hours until the pain is relieved, then every five or six hours.

If desirable, a pill, containing a moderate dose of colchicum, together with some aperient, may also be given at night, as well as the above mixture; as, for instance, the following:—

℞ Extr. colchici acetici	6 grains.
Podophylli resinæ	1 grain.
Pil. colocynthidis et hyos.	24 grains.

M. et divide in pil. 6. One at night.

The best local treatment,* for the relief of the pain, is to pack the joint with a warm alkaline and opium lotion. A lotion, containing half an ounce of carbonate of soda in crystals and 2 drachms of laudanum, to 10 ounces of water, should be prescribed. A portion of this should be mixed with an equal quantity of hot water, and pieces of lint or soft linen, thoroughly wetted with it, should be wrapped freely round the joint, and some of the hot lotion poured over this dressing. The joint and dressing should then be enveloped in cotton wool and covered with a layer of oil-silk. The foot should be raised a little and placed on a comfortable cushion or pillow. It is often remarkable how rapidly this application will relieve the pain in the joint.

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* Many local applications for the relief of the pain have been suggested, such as cocaine, ichthyol, menthol, camphor, chloral, and liniments containing morphine and belladonna, formulæ for which will be found at the end of the chapter.

We have already said that we do not approve of the internal use of opium if it can possibly be avoided; but in the feeble and debilitated, if the pain is excessively severe, and there is no renal disease, we may give 10 grains of Dover's powder, with half a dram of spirits of nitrous ether, in an ounce of camphor water occasionally. It is not often desirable to give morphine hypodermically. There is, however, no objection to a full dose of potassium bromide (30 grains), with tincture of hyoscyamus (half a dram), to procure sleep.

During the acute attack the diet, except in debilitated subjects, must be light and fluid.

Warm drinks to promote the action of the skin are useful. We should, therefore, limit the food to hot milk and water, thin oatmeal gruel, whey, weak veal or chicken broth; and we see no objection to an occasional cup of weak tea, with a little dry toast, as this often proves very refreshing and grateful to the patient.

During convalescence the diet should still be very carefully restricted. A little boiled mutton, or chicken and rice, or a grilled sole or whiting with sliced lemon, may be permitted once a day, and a poached or boiled egg with dry toast at breakfast. Beyond this only the light fluid foods already mentioned should be allowed. At this time a light bitter tonic, with some alkali, should be given twice daily, and we should be careful to see that the urine is maintained free from acid lithates, and that there is daily a free action of the bowels. The following mixture may be prescribed :—

℞ Potassii bicarb.	2 drams.
Sodii bicarb.	80 grains.
Spir. ammonii aromat.	4 drams.
Infusi calumbæ	ad 8 oz.

M. f. mist. Two tablespoonfuls to be taken twice daily.

Any inflammatory thickening and impaired mobility left about the joint may require the application of iodine, or the rubbing in of the linimentum potassii iodidi cum sapone, together with gentle passive movements.

Some have advocated the treatment of the acute joint attack by quinine as an antipyretic, and in debilitated subjects we see no objection to the use of quinine in an effervescent alkaline mixture, according to a formula we have already given (vol. i. p. 563). Garrod has advocated a combination of quinine and alkalies in subacute cases. Dujardin-Beaumetz suggests that it should be combined with colchicum. This author has also suggested the use of antipyrin, to relieve the articular pain, in doses of from 30 to 45 grains in the day.

In broken-down constitutions it may be needful to give a more generous diet during the acute attacks, such as beef-tea, clear soups, whipped eggs, in addition to gruel, milk, and other farinaceous foods; and a certain amount of stimulant, such as 2 or 3 ounces of cognac or old whisky daily, diluted with hot milk, may be allowed.

The appropriate treatment of the constitutional state during the intervals, and of cases of chronic gout, will be, to a great extent, gathered from what has preceded. We have referred to the value of such medicinal agents as colchicum, guaiacum, potassium iodide, the salicylates, the alkalies, and the various mineral waters; and suitable formulæ for some of these will be given at the end of this chapter. Phosphate of ammonia, chloride of ammonium, phosphate of soda, have also their advocates for the treatment of chronic gout. In what has been termed atonic gout, which we take to mean subacute and chronic gouty manifestations in feeble constitutions, stomachic *bitters* and aromatics were at one time highly esteemed (such as the Portland powder), and their use has been recently revived in the popularity of the *Pistoja* powders for the treatment of chronic gout. These powders are prepared at the "Pharmacy of the R. R. Benedictine Sisters," at Pistoja, in Tuscany.* Some gouty patients have assured us that they have derived great benefit from their use. A powder has to be taken daily, in "half a glass of cold water or tepid coffee two hours before breakfast," for a whole year without interruption. "The blood must be under the essentially depurative action of the medicines for four entire seasons." These powders are asserted to contain "no colchicum or belladonna or other poisonous substances," but are composed "of medicinal herbs, none of which can have a bad effect on the patient." They are known to contain gentian.

It is certain that the most important point in the management of the gouty constitution is to keep assiduous watch over the digestive and assimilative functions; vegetable bitters with alkalies are of the greatest service in this respect. They should be given about an hour before the two principal meals. The bowels should never be allowed to become constipated, and the urine should be frequently examined, as slight abnormal changes in this excretion often furnish the earliest signs of disturbed retrograde metamorphosis.

Finally, we must consider the **dietetic** and **regiminal** treatment of gout.

It is universally admitted that in the treatment of gout we must take largely into account questions of diet and mode of life. Apart from the influence of heredity, which is the chief etiological factor, no other cause is so influential in its production as habitual excesses or errors in eating and drinking; and, even when the hereditary tendency is strongly pronounced, very much may be accomplished by careful attention to dietetic rules, so as to keep in abeyance its more serious manifestations. It would, however, be a grave error to conclude that all the victims of gout merit the reproach of intemperance, or that they should all be submitted to the routine of a rigid abstinence. One of the greatest differences of opinion at present existing with regard to the most appropriate food for the gouty is that which has arisen in connection with Ebstein's views on this subject. He maintains that one of the most compromising conditions that can affect a person predisposed to gout is obesity. He says: "The gouty who have grown old in spite of their disease are almost always those who have been able to avoid obesity"; and he considers the treatment of obesity an essential element in the treatment of gout. His method consists in allowing sufficient albuminous food for the physiological wants of the body, equal to from 7 to 9 ounces of roast or boiled meat per diem. But, instead of avoiding fat, he encourages his gouty patients to take it, for he contends that the addition of a suitable amount of fat to the food is the best means of combating obesity. So far, he says, from increasing their fat under this regimen they become thin, while their physical and intellectual faculties are improved. He explains this by the rapid manner in which fat allays the appetite or craving for food, and so prevents its excessive consumption. It also diminishes thirst and lessens the tendency to drink large quantities of fluid. Good fresh butter he considers the best form of fat. He allows from two to three and a half ounces a day. He forbids starchy matters, or limits their consumption to two and a half to three and a half ounces a day. He forbids sugar, farinaceous foods and potatoes. He allows a moderate quantity of fruit and vegetables—peas, lentils, and beans in the form of *purées*, spinach, cauliflower, red cabbage, but forbids turnips. It has been clearly established that in gout no good results from abstention from a moderate amount of animal food, and harm has no doubt occasionally been done by too severe a limitation in this respect, in the case of feeble persons.

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* Powders for a whole year (one daily) are supplied for 50 francs, and for six months for 26 francs.

For our own part, we object to a diet in which there is much fat or saccharine and starchy substances, on the grounds that, by affording the system material for combustion, these substances tend to check the metabolism of nitrogenous compounds and prevent their complete elimination. We agree with Senator, who says there should be a minimum of fat. He objects also particularly to yolk of egg, on account of the amount of fat and *lecithin* (an abundant source of phosphoric acid) it contains. Tea and coffee he forbids, and when they are found to disturb digestion this is sound advice, but otherwise we see no objection to weak tea.

In these matters we consider each patient requires a separate study, especially with regard to digestive peculiarities; and that our object should be, in accordance with and in subordination to certain generally admitted truths, to construct a diet which shall be readily digested, and which does not tend to excite acidity, and undue fermentation in the alimentary tract; and *that* diet will differ with different persons. An excess of nitrogenous food (animal flesh) should be specially avoided. Races who are vegetarian feeders are free from gout. A Persian physician, now in England, has publicly notified that in Persia gout is only met with amongst the rich, who are the only persons who eat flesh; and in England gout is infrequent amongst the poor, and is chiefly prevalent amongst those who feed well and consume animal food freely. On the other hand, we are quite satisfied that in the present day we often encounter the neurotic manifestations of this diathesis, in persons who are delicate feeders with small appetites, and who consume a minimum rather than a maximum amount of food.

A most essential matter in arranging the diet of the gouty is to insist that the constituents of each meal shall be simple and of like nature and mode of digestion. We should not mix up albuminates, fats, and carbohydrates, or flesh, vegetables, fat and fruit, in the same meal. One meal should be composed almost exclusively of nitrogenous food, another of fats and carbohydrates, and another of fruit, at proper intervals, and they will all agree and be suitable; but the contrary will be the case if they are mixed together in the same meal, one hindering the digestion of the other. Ripe and cooked fruit *taken alone* will be found beneficial to many gouty persons; but it should not be mixed with other kinds of food, for then it will disturb and delay digestion.

A most important question in connection with the management of the gouty diathesis is the use of alcoholic drinks. In some persons, and especially in women, it is best to avoid them altogether; in others their moderate and discriminating use is not injurious. Of all alcoholic beverages, malt liquors are most prejudicial in this diathesis, and bad-quality wines. With regard to wines, it is not the name but the quality of the wine which is important; and no greater error has ever crept into medical practice than that exceedingly common one of advising everybody to drink light claret. A more injurious beverage than bad claret, or imperfectly matured claret—and, speaking generally, all but the more expensive or most carefully selected clarets are bad—was never drunk. Cheap clarets consist of admixtures of the worst and most valueless wines that are grown on the surface of the globe.

Half a glass of bad sherry or claret will produce a decided disturbance of health, when much larger quantities of fine-quality wines will pass through the system without injury.

We made an observation long ago, of the value of which we are more and more convinced ; it is that the wines which act freely as diuretics are the wines which agree best with all persons. In some this will be champagne, in others claret, in others hock, and so on ; but they are always, or nearly always, wines of good and often very fine quality.

A very eminent physician of New York told us that he found champagne and port—carefully selected —the best remedies for *his* gout. We have certainly known many gouty persons who found champagne the wine that suited them best. But it will also happen that gouty persons who have drunk champagne with impunity for many years will suddenly find that it provokes some form of goutiness which disappears on relinquishing the use of this wine. For those who find a certain amount of wine a necessity, it is advisable that they should add to the wine they drink a small quantity of an alkaline water.

Some years ago we began recommending *still* Moselle mixed with Apollinaris water for thirsty persons who required a "big drink." We find from the German wine merchants that these *still* wines of the Moselle have been so largely recommended of late years to gouty persons that their price has advanced more than 25 per cent.

Persons who assert that they cannot carry on their business or occupations without a certain small amount of alcoholic stimulant, or who find their appetite and digestion impaired by total abstinence, may be permitted 2 or 3 tablespoonfuls of old whisky or good cognac daily, freely diluted with water. But it is undoubtedly better for the gouty person to abstain entirely from alcohol if he can do so with comfort.* We have already insisted on the advisability of a free consumption of water by the gouty.

A great deal has been said about the importance of **exercise** for gouty persons, and no doubt a sufficiency of exercise is important to all persons. But gout is a disease which prevails amongst a class of persons who take a vast amount of physical exercise, and often of a very energetic kind, and so produce a large amount of nitrogenous waste. Moderate, regular, out-of-door exercise should certainly be inculcated, but excessive exercise we think injurious.

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* For a fuller examination of the subject of Diet in Gout, see the author's work on "Food in Health and Disease," part ii. chap. v.

The comparatively slight incidence of gout in women as compared with men, who lead much more active lives, points in the same direction—viz. that want of exercise is not such an important feature in the etiology of gout as has been imagined.

A due relation between food and exercise should, however, be observed. Women who take comparatively little exercise are often small eaters, and those who find it impossible to take an adequate amount of exercise daily must restrict their intake of food accordingly.

As to **climate**, we are convinced that a climate that is warm, dry, and equable is most advantageous to the subjects of this diathesis, and that climatic conditions which interfere with the free action of the skin are most prejudicial. It is a matter of common observation with patients themselves, that if the action of the skin gets disturbed by the onset of a cold east wind they soon begin to feel "gouty."

When there is a tendency to renal changes, or to recurrent attacks of subacute gout, it is advantageous, when possible, for such patients to winter in a warmer, drier, and more equable climate than that of England.

ADDITIONAL FORMULÆ.

For acute gout.

℞ Vini colchici, ½ dram.
Magnesii carb., 15 grains.
Aquæ cinnam., 1 oz.

M. f. haustus. To be taken at bed-time. (*Brande.*)

Anti-gout tincture.

℞ Tinct. sem. colchici, ½ oz.
Tinct. rad. aconiti, ½ oz.
Tinct. guaiaci, ½ oz.
Tinct. quininæ, ½ oz.

M. f. tinct. Thirty drops in a glass of ash-flower tea three times a day. (*Dujardin-Beaumetz.*)

Mixture for chronic gout.

℞ Potassii iodidi, 2 drams.
Potassii bicarbonatis, 6 drs.
Vini colchici, 2 drams.
Aquæ camphoræ, 12 oz.

M. f. mist. A tablespoonful three times a day in a wineglassful of water after meals. (*Whitla.*)

Mixture for the gouty diathesis.

℞ Lithii hippuratis, 1 dram.
Syrupi aurantii, 1 oz.
Aquæ ad 6 oz.

M. f. mist. A tablespoonful in water at bed-time. (*Prof. Stewart.*)

Mixture for acute gout.

℞ Tinct. rad. aconiti, 1 dram.
Morphinæ sulphatis, 2 grains.
Antim. tartarati, 1 grain.
Syrupi zingib., ½ oz.
Aquæ ad 2 oz.

M. f. mist. A teaspoonful every three hours. (*Prof. Gross.*)

Pills for the gouty diathesis.

℞ Ext. maidis stig., 1½ dram.
Sodii benzoatis, 40 grains.
Lithii carbonati, 40 grains.
Ol. anisi, 3 drops.

M. et divide in pil. 60. Take two before meals thrice daily for twenty days in each month. (*Huchard.*)

Pills for visceral gout.

℞ Colchicini, 1 grain.
Quininæ hydroch., 72 grains.
Morphinæ hydroch., 6 grains.

M. et divide in pil. 24. A pill every four or six hours. (*F. Woodbury.*)

Gout pills.

℞ Extr. colchici acet., 18 grains.
Extr. colocynth. comp., 18 gr.
Pulv. ipecac. comp., 18 grns.

M. et divide in pil. 12. One night and morning. (*Halford.*)

Piperazine mixture for gout.

℞ Piperazine puri, 15 grains.
Syrupi aurantii, 5 drams.
Aquæ, 5 oz.

M. f. mist. To be taken during the day. (*Brik.*)

Pills in gout.

℞ Extr. colchici acet., 6 grains.
Extr. rhei, 6 grains.
Extr. aloes socot., 6 grains.
Extr. belladonnæ, 1 grain.

M. et divide in pil. 6. One twice a week at bed-time. (*Garrod.*)

Liniment for acute gout.

℞ Morphinæ hydrochlor., 10 grains.
Linim. belladonnæ, 3 oz.

M. et f. linim. A teaspoonful to be mixed with a tablespoonful of hot water, and applied on lint under oil-silk every four hours. (*Garrod.*)

Local application for acute gout.

℞ Atropinæ, 3 grains.
Morphinæ hydrochlor., 15 gr.
Acidi oleici, 1 oz.

Solve ut f. linim. To be painted over the painful joint with a large camel-hair brush, and the joint wrapped in cotton wool. (*Duckworth.*)

Liniment in gout.

℞ Tinct. opii, 1 oz.
Lin. saponis, 2 oz.

M. f. linim. To be kept in contact with the affected joint on flannel covered with oil-silk. (*Prof. Gross.*)

Soothing ointment for acute gout.

℞ Extracti opii, 45 grains.
Extr. hyoscyami, 1½ to 2 drs.
Adipis, 1 oz.

M. f. ung. The painful joints to be anointed with this ointment and then covered with cotton wool. (*Charcot.*)

CHAPTER IV.

THE TREATMENT OF DIABETES.

Definition and Nature of the Disease—Temporary Glycosuria—Glycogenic and Sugar-forming Functions of the Liver—The Normal Glycolytic Process in the Body suspended or impaired in Diabetes — Also a "*Hepatogenous*" Form dependent on Disturbances of the Glycogenic Functions of the Liver—*Slight* and *Grave* Forms, their Clinical Characters — *Pancreatic* Diabetes—Symptoms and Course—Characters of Urine—Etiology—Treatment—Dietetic—Exclusion of Carbohydrates (Muscular Exercise)—Dangers of an Exclusive Dietary—Possibility of Modifications—Milk—Substitutes for Bread—Permissible Foods and Beverages—Mineral Waters—Carlsbad — Vichy — Neuenahr — *Hygienic* Treatment — *Medicinal* Treatment—Opium — Morphia — Codeia—Alkalies—Arsenic—Potassium Bromide—Antipyrin—Sulphonal—Sodium Salicylate—Jambul—Oxygen, etc., etc.—Pilocarpine—Pancreatic Extracts—*Treatment of certain Distressing Symptoms*—Thirst—Inflammation of Gums and Dental Caries—Constipation—Flatulence—Cutaneous Irritation—Cystitis—Diabetic Coma—Model Dietaries. Additional Formulæ.

DIABETES may be defined as a disturbance of nutrition, characterised by the accumulation of sugar in the blood and its excretion in the urine, the amount of which is usually greatly increased. Although the pathology and etiology of this disease are still shrouded in obscurity, and the treatment almost wholly directed to the control of one symptom, the glycosuria, it will be advisable to discuss, very briefly, one or two points connected with its pathology before we enter upon the consideration of its therapeutics.*

In health the starchy substances, together with the sugar of our food (carbohydrates), the former being converted into sugar in the processes of digestion, are, after absorption, wholly consumed and utilised in the body. None, or practically none, pass out of the body as sugar. In diabetes it is otherwise, and a more or less notable amount of sugar passes out of the body in the urine; and it has been found, by observation, that the amount of sugar passing out in the urine is usually proportionate to the amount of saccharine and starchy substances entering into the diet. Moreover, in one form of this disease, and that by far the *more serious*, sugar appears in the urine even when the food is restricted absolutely to albuminates and fats, and when carbohydrates are totally excluded. This sugar it has been shown is formed in the liver at the expense of the albuminates and fats; and Seegen considers that he and others have demonstrated, experimentally, that this is a part of the regular functions of the liver in health. The *sugar-forming* function of the liver, he asserts, is not directly influenced by the carbohydrates of the food; but the formation of *glycogen* in the liver, on the contrary, is closely related to the ingestion of carbohydrates.*

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* For a fuller examination of this part of the subject see the author's "Food in Health and Disease," part ii. chap. iii.

In health, the sugar which is taken into or formed within the organism is, directly or indirectly, utilised in the production of force; in diabetes a greater or less proportion of it escapes from the body unconsumed.

The occasional and temporary presence of a small amount of sugar in the urine, in certain persons, appears to have no serious import, and is ordinarily referrible to an excess of saccharine or starchy substances in the food, so that sugar is added to the blood more rapidly, or in larger quantity, than can be fully stored up as glycogen, or consumed in the processes of nutrition.

In health, then, sugar is continually being added to the blood by the liver, the greater part being derived from the carbohydrates of the food, which the liver has the power of converting into and storing up in its cells as non-diffusible glycogen, a fact long ago established by Claude Bernard. In this way the liver is regarded as acting as a regulator of the sugar-forming process, storing up in its cells glycogen by conversion of the alimentary glucose, reaching it in the blood of the portal vein, and then, by reconversion of this glycogen into sugar, providing a fixed and constant supply of sugar to the blood.

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* *La Glycogenie Animale*, by Prof. J. Seegen, of Vienna. Translated into French by Dr. L. Hahn, Librarian to the Faculty of Medicine, Paris, 1890.

But it is now suggested that we should recognise another regular supply of sugar to the blood, from what Seegen considers he has demonstrated to be a *normal* sugar-forming function of the liver, at the expense of albuminates and fats. We shall see presently how these facts are applied to the explanation of the two recognised forms of diabetes, the *slighter* and the *graver* form.

The view formerly taught by Pavy, that the presence of sugar in the blood, in any but a very small and insignificant quantity, was morbid, and was the cause of sugar appearing in the urine, and that sugar did not undergo combustion in the capillaries, is no longer tenable. We have now returned to the view originally advanced by Claude Bernard, that the blood in health always contains a certain amount of sugar, which is consumed in the capillaries, in the normal processes of nutrition and force-formation, and is ultimately eliminated in the form of carbonic acid and water.

Diabetes, then, will occur under either of two conditions—first, when sugar is added to the blood in quantity greater than can be consumed in the normal processes of nutrition; or, secondly, when the normal function of sugar destruction in the blood (glycolysis) is disturbed or arrested.

We may thus have diabetes dependent (1) on disturbances of the glycogenic functions of the liver, or (2) on disturbances in the nutritive (glycolytic) changes in the blood and tissues.

Seegen terms the first group "*hepatogenous*," and regards it as comprising the slighter forms of diabetes, and he suggests that it is due to an inhibition of the functional activity of the hepatic cells devoted to the formation of glycogen, the cause of this inhibition being unknown. In the production of the second and *grave* form he maintains the glycogenic function of the liver has no share. In this form the "whole organism, or a more or less considerable part of its elements, has lost the faculty of destroying the sugar of the blood."

The clinical characters and the prognosis differ greatly in these two forms.

The diabetics of the first group are well nourished and often *fat*, with a fresh complexion and a moist skin. They rarely suffer from the ravenous hunger, the excessive thirst, and the extreme polyuria of the second group.

Those of the second group emaciate with great rapidity. Their skin is dry and rough, the face pale or slightly livid, their muscular power is reduced to a minimum, their hunger is insatiable, and their thirst and polyuria are excessive. The first form is usually seen in persons past middle age; the second form in the young.

A further and most important distinction is that the diabetics of the first group lose their glycosuria, and the other symptoms associated therewith, on the withdrawal from their diet of all carbohydrates; those of the second group, on the contrary, do not lose their glycosuria, even when restricted to an exclusively animal régime, although the amount of sugar excreted may be diminished. Occasionally, though rarely, the first form may pass into the second; but this is quite exceptional.

They differ also gravely in prognosis. With a suitable diabetic regimen, and a cautious and careful mode of life, diabetics of the first group may continue to discharge the active duties of life, the natural term of which may be scarcely, if at all, shortened; those of the second form, to whatever régime they may be submitted, rapidly lose all their strength, become utter wrecks, and a fatal issue as a rule rapidly supervenes.

To the second and grave form must be referred those cases of **pancreatic diabetes** to which the researches of Minkowski and Von Mering, and Lépine and Burral, have recently directed special attention. Post-mortem examinations have shown that some exceedingly acute and grave forms of diabetes have been associated with serious structural changes in the pancreas, and many observers have proved, by experiments on animals, that total extirpation of this gland is followed by a severe form of diabetes.

Lépine and Burral suggest that in the normal state the pancreas elaborates and pours into the blood through the lymph stream (not through its duct into the intestine) a *glycolytic* ferment which determines the destruction of sugar in the circulation, and the loss, from disease of the pancreas, of this ferment in the blood would necessarily lead to diabetes ; and as this would probably coincide with the loss of the fat-digesting and other assimilative functions of the pancreas, serious and progressive wasting would attend the glycosuria. This latter assumption has, however, been questioned, and it has been suggested, as more probable, that the wasting and debility depend on toxic substances being retained in the organism, which are normally excreted by the pancreas. We cannot here pursue this interesting inquiry further, but it was necessary to call attention to these researches, as already therapeutic suggestions have grown out of them.

The *chief* **symptoms** of the graver forms of diabetes are glycosuria, polyuria, excessive thirst, and hunger. The tongue is usually dry, red, and glazed ; the skin is dry and harsh, the bowels are constipated. Great and rapid emaciation occurs in the younger subjects. Itching of the skin, and irritation of the genitals, eczema, boils, and carbuncles, are apt to occur. Slight albuminuria is frequent. Pulmonary phthisis is a common termination of the graver form in *young* subjects ; and serious forms of pneumonia followed by gangrene are not uncommon. The same symptoms, but modified in the manner already referred to, occur in the slighter forms.

Diabetic coma is a most serious complication, and leads to a fatal result in many of the younger subjects of this disease. Whether this condition is or is not due to the development of *acetone* in the blood is still a matter of dispute.

The **urine** in diabetes is usually excessively abundant; it varies, however, greatly in amount; in mild cases it may reach from six to ten pints, and in severe cases even to thirty and forty pints, daily. Occasionally we find the quantity of urine scarcely at all augmented. The density is usually high, but not always so, and we must not conclude that a urine is free from sugar because it is of low density. The specific gravity of the urine in diabetes ordinarily fluctuates, according to the amount of sugar it contains, between 1025 and 1050. The amount of sugar in the urine may vary from a mere trace up to as much as nearly 50 grains in the ounce, and the total amount excreted in twenty-four hours may range from a few grains up to twenty or thirty ounces! Diabetic urine is pale and clear, and does not deposit urates on cooling.

Dujardin-Beaumetz's division of diabetics into three groups, according to the results obtained from repeated examinations of the urine, (1) *slight* cases, (2) cases of *moderate severity*, and (3) *grave* cases, will be found practically convenient. If, notwithstanding the strictest dietary, you still find the urine contains from ten to twenty grains of sugar per ounce, the case belongs to the third group, and will pursue a steadily downward course, no matter what treatment is adopted. If, however, as a result of strict and careful dietary, the amount of sugar in the urine becomes reduced to three or four grains in the ounce, the case is one of medium intensity. These patients are liable to be attacked by intercurrent maladies, pulmonary (pneumonia) and cerebral (diabetic coma), and their existence is therefore somewhat precarious, but by diet, regimen, and medicinal treatment they may be protected, to a certain extent, from these fatal accidents. The *slight* cases are those in which *all* the sugar quickly disappears from the urine, on the adoption of a strict and appropriate dietary. Such patients often belong to the gouty type; they are often *fat*, and they may be passing as much as six to eight ounces of sugar daily, which will wholly disappear after a few days of a diet from which all carbohydrates have been eliminated. Any return, however, to the ordinary diet is usually followed by the immediate reappearance of sugar in the urine.

The *quantitative* estimation of the sugar in the urine is thus most important, from the point of view both of prognosis and treatment.

Certain facts have been made out with regard to the **etiology** of diabetes. Hereditary tendency appears in a decided manner in a certain proportion of cases; it has been observed to follow, in some cases, traumatic and other lesions of the nervous centres; it has apparently been traceable occasionally to emotional shock, anxiety and mental strain; a racial tendency has been noted, especially in Hebrews; it is rare in childhood, and is most common between 30 and 60 years of age; it occurs far more frequently in men than in women; and the *gouty* diathesis is supposed to be a predisposing cause.

We must now pass from this necessarily brief sketch of the general features of this disease to the consideration of its treatment.

The **dietetic treatment** of the diabetic necessarily occupies the foremost place in their management. By diet alone we can arrest the glycosuria in many cases, and diminish considerably the amount of sugar excreted in others. At the same time we diminish also the thirst, the polyuria, and other symptoms.

The principle which governs the construction of a dietary for the diabetic, is the elimination of all those articles of food, which either contain sugar or substances that can be converted into sugar in the organism; in short, all food substances containing carbohydrates.

This is not, in all cases, easy, as we have to consider also how to maintain the nutrition of these patients at an average standard, and we must be careful not to enforce too rigorously a diet, which is obviously impairing the general strength and nutrition of the patient.

In the *fat* diabetics, the well-nourished and sometimes gouty types, we may prescribe with advantage the strictest alimentary regimen; but with the emaciated subjects of the grave form of this malady we have a far more difficult task, for not only have we to consider how we can arrest or check the excessive excretion of sugar, but also how we may best control the co-existing grave disturbances of general nutrition. It is universally admitted that the basis of a suitable dietary for diabetics is the exclusion of carbohydrates and their replacement by albuminates and fats. Clinical observations also show that the amount of sugar excreted in the urine, so far as it is dependent on the diet, exercises a great influence on the well-being of the patient. The distressing thirst of the diabetic patient is determined by the amount of sugar in the blood, and we can only relieve the former by a diet which will also tend to diminish the latter. Even in grave cases, in which sugar still continues to be present in the urine, although the diet is wholly without carbohydrates, yet its amount is lessened, and this is so far a gain. We must, therefore, bear in mind that, by an exclusively animal diet, the excretion of sugar in the slighter cases may be wholly arrested or suspended, and even in more severe and in grave cases it may be kept at a lower figure.

Albuminates and fats, then, should form, as far as possible, the sole food of the diabetic, but some concessions will, however, have to be made occasionally to the feelings and wishes, and sometimes to the real needs, of the patient. Moreover, the capacity for utilising sugar is not wholly lost in all cases, and patients have been found able, even in somewhat advanced stages of this disease, to metabolise large quantities of carbohydrates. *Muscular exercise,* within certain reasonable limits, has also been strongly advocated by Bouchardat, Dujardin-Beaumetz, and others, because of its influence in promoting the oxidation and metabolism of sugar in the organism, and so diminishing its excretion to a corresponding extent. But it must not be overlooked that, in the grave form, physical exercise is badly borne, and that its chief value is in the well-nourished group. But apart from the tastes and wishes of the patients, there are certain physiological objections to a diet composed exclusively of meat and fats. It tends to aggravate the disposition observed in many diabetics to an increased excretion of the nitrogenous elements of the urine, and especially to the formation of uric-acid deposits. It has also been stated by Ebstein and others that an exclusively meat diet favours the development of *acetone* in the blood.

It is a good practical rule to test occasionally the capacity of our diabetic patients to metabolise certain carbohydrates, and we may, from time to time, discover individual peculiarities in this respect, which will enable us to enlarge the dietary in that direction for a longer or shorter period.

This would seem to be the case with regard to **milk,** as different physicians bear very conflicting testimony as to the value of this article of diet in diabetes. Scott Donkin maintained that he had succeeded by an exclusive (skimmed) milk diet in removing the sugar entirely from the urine of diabetics in a fortnight, and this is quite conceivable in cases of glycosuria in fat, gouty, over-fed persons. For them this would be an extremely limited dietary, cutting off *all excess,* from which excess probably *alone* the sugar in the urine was derived. Whitla states that he has seen at least three cases in which this treatment was followed by "most decided benefits."

Frerichs, Bouchardat, G. Sée, Dujardin-Beaumetz, and others discard milk entirely from the diet of diabetics, and consider that it increases the amount of sugar in the urine. On the other hand, Bauer* considers it may be permitted in moderation, and Külz found that while some of his patients bore it badly, others tolerated it remarkably well. Sir William Roberts thinks it less harmful to diabetics than might have been supposed, and would allow a limited supply, but considers it better to replace it by cream.†

Great practical difficulties arise in attempting to construct a dietary composed exclusively of albuminates and fats, the amount of fat needed to supply the quantity of carbon required in the system is with difficulty appropriated by the organs of digestion, and to attempt to supply the necessary carbon by albuminates alone would require a quantity of such foods altogether unmanageable. We are, therefore, driven to adopt a *mixed* diet, the various articles of which have to be chosen with special regard to the amount of sugar-forming substances they contain, selecting those which contain the minimum, and placing albuminates and fats as the chief nutritive elements of the dietary.

The ingenuity of physicians has been greatly taxed to produce a *bread* for the diabetic which may form an efficient substitute for ordinary bread, which is so rich in carbohydrates. *Gluten* bread suggested by Bouchardat supplies this need only moderately well; it is often carelessly prepared, and many samples are found to contain a considerable proportion of starch, and it is never entirely free from it; it is also dry and unpalatable. Gluten meal is also used for thickening broths and for making puddings. *Bran* biscuits made according to Dr. Camplin's formula* are tolerably free from starch.

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* "Dietary of the Sick," p. 296.

† Dr. Wright has suggested a somewhat complex method of removing the lactose from milk, and reconstituting an artificial milk without sugar, but this is scarcely a help, as the desire has been to utilise a form of food which is extremely handy and available, and not to obtain an artificial fluid made with some difficulty.

"Torrified" bread—made by toasting thin slices of ordinary bread before the fire until they are deeply and thoroughly browned, almost blackened, so that the starch and gluten are in great part destroyed by heat—is acceptable to many diabetics. Cakes made of almond meal, from which the sugar has been removed by washing with acidulated water, have been recommended by Seegen and Pavy. G. Sée and Dujardin-Beaumetz do not approve either of gluten bread or almond cakes. In the former they find a considerable proportion of starch, and it would seem that the gluten bread prepared in Paris is not to be relied upon. G. Sée thinks it best to allow a small quantity of ordinary bread—five ounces daily—and Dujardin-Beaumetz prefers a small quantity of potato meal, about three ounces twice a day, for patients who cannot do without food of this kind. One potato, weighing not more than three ounces, eaten with butter is what he recommends. This author has also warmly praised Soya † bread as better than any of the gluten breads, but we have found patients decline to eat it on account of its peculiar strong taste.

Ebstein has recently advocated a bread for diabetics made of a patented gluten flour extracted by a new chemical process from wheat, and termed "*Aleuronat.*" ‡ It is composed almost wholly of vegetable albumen, with only 7 per cent. of carbohydrates and about 9 per cent. of water. He claims for it many advantages over other forms of gluten, amongst others that it can be transported to any climate without fear of decomposition or putrefaction.

All kinds of animal flesh and fat are permitted (except liver) as well as preserved meats, when sugar has not been used to preserve them; also fish of all kinds, and eggs, cheese, butter, cream, and oil. No flour or starchy material must be used in cooking for the diabetic. Sardines in oil, pâté de foie gras, caviare, cod's roe—those and similar relishes are all permissible. Green and fresh vegetables and salads (dressed abundantly with oil) may be freely consumed—cabbage, spinach, sorrel, dandelion, lettuce, cucumber, watercresses, mustard and cress; and some physicians allow, in small quantity, green French beans, asparagus, celery, onions, and leeks.

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* See the Author's "Food in Health and Disease," p. 417.

† Soya Bread and Biscuits can be obtained at Van Abbott's, 6, Duke Street Mansions, London, W.

‡ From the Greek word ἄλευρον, flour; this patented preparation is to be obtained from R. Hundhausen, of Hamm, Westphalia.

All vegetables and fruits containing a large proportion of starch or sugar must be forbidden. Some authorities consider a moderate amount of fresh acidulous fruit permissible—such as gooseberries, currants, apples, etc.

The best test, however, of any article of diet is its effect on the urine, and with daily observations of the urine it is easy to determine individual peculiarities in this respect. We should also weigh our patients frequently so as to observe the effect of the dietary adopted on their general nutrition.

The diabetic patient suffers much from thirst, and it is therefore a question of some importance *what he may drink.* Alcoholic beverages should only be allowed in small quantity or not at all, as the temptation to excess is great. There is, however, no harm in a little non-saccharine wine, such as claret, hock, or still Moselle, diluted with water or with some effervescent alkaline water; or small quantities of whisky, brandy, or dry gin, largely diluted, may be substituted if required.

There is no objection to light infusions of tea, coffee, maté, or kola, and these may be sweetened with a little saccharine.

The **food indications** may be thus summarised:—1. Avoid, or reduce to a minimum, all substances containing starch or sugar. 2. Give as much animal food—meat of all kinds—as can be comfortably digested and assimilated. 3. Replace the discarded carbohydrates by suitable substitutes from amongst the various animal and vegetable fats and oils. 4. In the stout and well-nourished, encourage muscular exercise to consume the excess of sugar in the blood; but do not push this to the extent of producing fatigue, which is injurious. By these dietetic measures the symptoms even of the *grave* form of this disease may be ameliorated, while those of the slighter forms, together with the glycosuria, wholly disappear. But it would be an error to conclude that these cases, save in quite exceptional instances, are *cured.* A return to ordinary diet with a full supply of carbohydrates will usually be attended with a return of the glycosuria, and such persons have to continue a more or less careful observance of the regimen we have sketched, for the rest of their lives.

It has, however, been pointed out that it occasionally happens that the nutrition of a diabetic patient will improve on the addition of a little carbohydrate to his dietary, although, at the same time, an increased amount of sugar may be passed in the urine. This is due to the albumen-sparing action of the carbohydrates, so that they lessen nitrogenous metabolism, in diabetics of a severe type. The dietetic rules must therefore not be made too absolute, as it will happen, now and then, that the addition of a little ordinary bread to the dietary will be attended by an increase in weight, and an improvement in nutritive condition, in certain cases.

Next, perhaps, in importance to treatment by diet is treatment by **mineral waters.** The efficacy of certain mineral springs in the treatment of some forms of diabetes is well known to practical physicians, although it has, again and again, been argued that they cannot possibly be of the slightest utility.* The alkaline, the alkaline and aperient, and the alkaline and arsenical waters are those chiefly employed.

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* See especially on this head Dr. Otto Leichtenstern, "General Balneo-therapeutics," in Von Ziemssen's "Handbook of General Therapeutics," vol. iv. p. 363.

Vichy, Carlsbad and Bourboule may be taken as types of these. In what precise manner they act it is difficult to say, but there can be little doubt that alkalies do exercise an important influence over nutritive changes. With regard to Carlsbad, Professor Seegen, who practised there many years, and had seen more than a thousand cases, testifies that the Carlsbad course is of real utility, but only in the *slighter* form of the disease, not in the *grave* form. He considers the Carlsbad water acts by augmenting and maintaining for a time the tolerance of starchy foods, and that this may be explained by a special action on the hepatic cell, which under its influence recovers the faculty of utilising the starchy substances ingested. "If we remember," he says, "that the Carlsbad water certainly exercises a favourable action on all the functions of the liver, it will not seem extraordinary that we should attribute to it an analogous influence on the slight form of diabetes—that is to say, on hepatogenous diabetes." *

Dujardin-Beaumetz does not think these alkaline waters act directly on the liver, but rather on the general nutrition. He considers their use essential in the treatment of diabetes. Dr. R. Schmitz, of Neuenahr, has published an account of the treatment of many hundreds of cases at that spa with excellent results. Our own experience extends especially to Vichy, Carlsbad, and Neuenahr, and we have observed most satisfactory results from treatment at these spas in all cases of diabetes, except those of the *grave* form, and we are not aware that any kind of treatment has ever done more than produce slight and temporary amelioration in the latter group of cases. Dr. Debout d'Estrées testifies to the value of Contrexéville water in the case of gouty diabetics. He says "stout diabetics" and "gouty diabetics" rapidly lose their glycosuria there.

The use of certain of these alkaline waters should enter into the daily regimen of diabetic patients.

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* "La Glycogenie Animale," p. 242.

They tend to diminish the excessive thirst and the distressing dryness of the mouth, and to lessen the frequency of micturition and to allay cutaneous irritation. If we prescribe the stronger alkaline waters such as Vals or Vichy we may order from 3 to 6 ounces to be drunk half-an-hour before each meal; but the weaker waters, such as Apollinaris or Ems water, may be taken in larger quantity, and may be used to mix with wine. Dujardin-Beaumetz considers suitable hydrotherapeutic treatment of great value in the hygienic management of diabetics.

It is of great importance to protect the diabetic patient from any depressing influence, and from exposure of all kinds, as it is well known he bears any pulmonary or other attack of intercurrent disease badly. He should therefore be warmly clad, and should avoid any risk of chill from exposure to inclement weather. He should be protected from worry, fatigue, and strain of all kinds—emotional, intellectual, and physical. It is an advantage, when practicable, to pass the winter in a sunny, dry, and sheltered locality.

With respect to the utility of **drugs** in diabetes, it must be borne in mind that, in the lighter cases, the disease can be kept entirely under control by means of such dietetic and general measures as we have already set forth, and that drugs are not needed. We are not, of course, alluding to occasional aperients, antacids, or simple remedies of like nature. We would also point out that no method could be more misleading than that of prescribing drugs as remedies for the diabetic state *at the same time* that we are applying a rigorous dietary, unless we have first ascertained that the amount of benefit to be derived from dietetic treatment is limited; otherwise we run the risk of attributing to the use of the drug, benefits that may be wholly due to the diet. We should first, then, ascertain to what extent the symptoms are amenable to diet, and when we find that the most rigorous diet only leads to a moderate or small diminution in the quantity of the sugar excreted in the urine, we may fairly have recourse to drugs, and we may fairly attribute to them such amelioration as can be observed to follow their employment.

The only drug that has gained universal acceptance in the treatment of diabetes is **opium.** Some give the preparations of *opium* itself, and think them preferable; others give morphia; and others, including Pavy, give codeia. Seegen found morphia and Carlsbad water the two most efficacious remedies in diabetes, and he testifies that morphia incontestably diminishes the amount of sugar excreted in the urine in both forms of the disease. Although Pavy maintains the superiority of codeia, which is less constipating than morphia, and disturbs digestion less, Frazer, Bruce, Osler, and others, consider the latter the most suitable and most efficacious remedy. Codeia should be given at first in small doses, $\frac{1}{2}$ a grain three times a day, and this dose may be increased gradually to 4 or 5 grains thrice daily; or the watery extract of opium may be given in much the same dose as codeia. If we use morphia, we must begin with a smaller dose, $\frac{1}{6}$ grain thrice daily, and slowly increase the dose, if necessary, to a grain three times a day.

Diabetic patients tolerate large doses of opiates remarkably well, and large doses are often needed in order to produce any decided effect; but we do not approve of giving them in a routine manner, and we consider, as we have already indicated, that they should be reserved for those cases that cannot be controlled by diet. In the *graver* forms they no doubt serve a useful purpose; together with a careful diet, they seem to hold the disease in check. How they act is not known.

The effect of opiates must, of course, be carefully watched, and on observing any untoward effects, such as drowsiness, great loss of appetite, or disturbed digestion (these rarely occur when codeia is given), they must be withdrawn or greatly reduced in quantity. They are rarely indicated when albuminuria complicates glycosuria, and, if given, should be administered with great caution.

Of the value of **alkalies,** as represented by alkaline mineral waters, we have already spoken, but they may also be prescribed in the form of medicines, and often with great advantage. The amount of sugar in the urine has been observed to diminish steadily under alkaline treatment. It is possible they may exercise a favourable influence over the hepatic and nutritive functions.

The carbonates of sodium, potassium, and ammonium have been largely employed, and so also have the citrates and tartrates.

A combination of *lithium* carbonate and *sodium arseniate* dissolved in aërated water was found of remarkable value in the treatment of a number of cases of diabetes by the late Dr. Martineau, of Paris. He claimed to have cured 70 out of 76 cases! Dujardin-Beaumetz does not vouch for any such brilliant results, but he commends the treatment as often advantageous, especially in gouty cases. Five minims of liquor sodii arseniatis and 5 grains of lithium carbonate may be added to a small bottle of effervescing alkaline water and drunk twice a day at, or a little before, meals.

Arsenic has been said to inhibit sugar formation in animals, and the *bromide of arsenic* has enjoyed a considerable reputation, especially among certain American physicians, in the treatment of diabetes. A 2 per cent. solution is used and the dose is one minim, gradually increased to five minims, given after meals, thrice daily. It is said to diminish thirst and polyuria, to lessen the glycosuria and to be particularly serviceable in cases of a neurosal type. Fowler's solution has also been given in large doses up to 12 or 15 minims, according to the tolerance of the drug.

Potassium bromide, 15 to 30 grains daily, given in association with alkalies, has been credited by several trustworthy observers with the power of causing the sugar to disappear from the urine; others, however, object to its use on account of its depressing effects, or insist that its administration should be limited to those cases in which nervous irritability is a prominent symptom, and in which there exists a certain amount of physical vigour to support the lowering influence of this drug. It is better to give the sodium bromide instead, and to combine with it the ammoniated tincture of valerian, as a nervine stimulant. Valerian itself was a favourite remedy with Trousseau for polyuria.

Antipyrin and its congeners, phenacetin and acetanilide, have been advocated by the French school as remedies for the polyuria and the glycosuria. A diminution of the amount of urine and sugar excreted has been observed to follow the exhibition of antipyrin in doses of from 10 to 15 grains thrice a day. It is, however, a medicine to be avoided when there are any signs of renal irritation, as some observers have imagined they could trace the occurrence of albumen in the urine to its use.

It has recently been reported that *sulphonal* gives better results than antipyrin. It should not be given in doses of more than 30 grains a day, as larger doses have been found to cause great somnolence and vertigo.

Salicylic acid and *sodium salicylate* have been recommended by Furbringer, Haig, and others, in this disease as having a remarkable power, in some cases, of diminishing the excretion of sugar. Haig gives 60 to 70 grains of sodium salicylate daily, and thinks it superior to other remedies. Dr. M. Sympson also believes that he has seen remarkable benefit attend its use,* and Ralfe speaks favourably of its influence in certain cases associated with the gouty or rheumatic diathesis.

Salol and *benzosol* have also both been given with advantage in diabetes, the former in doses of 30 grains thrice daily, and the latter in rather smaller doses. There is sufficient testimony in their favour to warrant further trial of these drugs.

Most diverse reports have been made as to the efficacy of **jambul** in the treatment of diabetes.

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* *Practitioner*, 1891, vol. ii. p. 91.

Rosenblatt found that its use, in doses of from 1 to 4 drams daily, of the powdered seeds, or the liquid extract, was attended by relief of the hunger and thirst, a diminution of the amount of sugar in the urine, and in the quantity of urine passed, and an increase of weight. Dujardin-Beaumetz found it of no service in the grave forms, but of a certain value in those of moderate severity; when associated with a strict diet, it lessened the amount of sugar in the urine, but without a restricted diet it was useless. It has been suggested that those who have reported against it as worthless, have worked with specimens of inferior quality, or have not given sufficiently large doses. Recently good results have been reported from the administration of the double chloride of gold and sodium in doses of $\frac{1}{30}$-grain twice or thrice a day, gradually increased.

Numerous other remedies have been given in diabetes, with temporary benefit, and occasional relief of some of the symptoms; but their introducers have not succeeded in obtaining for them more than a brief popularity. Amongst these we may mention lactic acid, ergot, iodine, and iodoform, quinine, strychnine, belladonna, creasote, and carbolic acid, peroxide of hydrogen and oxygen, either aërated water containing the compressed gas or inhalations of the gas. Inhalations of oxygen have recently been warmly advocated by Purdy, who asserts that he has seen a reduction of fifty per cent. in the sugar excreted, without any change of diet, from the inhalation of from 3 to 5 gallons of the gas twice daily.* Semmola and others have reported good results from the application of a continuous current along the course of the vagus.

The recent researches into the relation between diabetes and disease of the **pancreas** have led to some therapeutic suggestions at which we can only briefly glance. *Pilocarpine* was administered in some cases by Lépine with the view of stimulating the pancreatic secretion; but, judging from the gravity of the lesions found in the pancreas in fatal cases, little could be hoped for from the use of this drug. The same criticism will apply to the suggestion that pancreatic extracts should be given in this disease. Indeed, no striking results have as yet followed the actual administration of such extracts in cases of diabetes. We see no objection to a full and patient trial of such measures; but it must be borne in mind that the slighter forms of diabetes are capable of being kept very fairly under control by such means as we already have at our disposal, especially by suitable dieting and the use of alkaline waters, while the grave forms have been found associated with very serious structural lesions, and we could scarcely hope to find a permanent remedy for morbid changes of that gravity.

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* Hare's "System of Practical Therapeutics," vol. i. p. 1030.

Certain **distressing symptoms** associated with this malady may call for remedial treatment. The *excessive thirst* will, of course, be diminished by whatever lessens the polyuria, or the amount of sugar in the blood; but when we fail in this, or only partially succeed, we must minister directly to the relief of the distressing symptom. There is no good reason why the patient should not drink freely of water; indeed it is rational to expect, that by adding to the blood considerable quantities of pure water, we shall help to prevent the undue accumulation of sugar in the circulating fluid, as well as minister to the relief of thirst.

We should arrange, however, that large draughts of water should precede and not immediately follow a meal, so as not to dilute too greatly the digestive ferments. The addition of a few drops of phosphoric acid, or of lemon juice, or a solution of bitartrate of potash to the water may be made if it is found to allay the thirst better; but nothing will clean and refresh the mouth so much as some weak alkaline water. Small fragments of ice may also be sucked. The *dental caries and inflammation of the gums*, so common in diabetics, from the morbid fermentations set up in the saccharine secretions in the mouth, are also beneficially affected by weak alkaline drinks.

An alkaline and antiseptic mouth-wash should also be used frequently. Listerine may be employed for this purpose, or 2 drams of borax, 1 dram of boric acid and 1 dram of potassium chlorate may be dissolved in a pint of camphor water for a mouth wash.

The intense craving for food and sense of *sinking* in the epigastrium, experienced by some patients, are relieved by 2 or 3 grains of asafœtida in a pill twice or three times a day.

Constipation may require an occasional aloetic pill, followed the next morning by a glass of Carlsbad water; or a dose of confection of senna or of castor oil. Flatulence and intestinal catarrh, from abnormal fermentation in the bowels, are best relieved by an initial aperient, together with a dose of creasote or thymol in a pill twice or thrice a day, after food; or the salicylate of bismuth may be given if there is a decided tendency to diarrhœa.

Intense itching of the skin and great irritation about the genital organs from the repeated contact of saccharine urine require attention. The surface of the body should be frequently sponged with tepid water and some absorbent material worn next the skin, such as thin flannel, which should be frequently changed. The genitals should be kept thoroughly clean and some absorbent cotton wool applied immediately after micturition. Eczema of the prepuce may require boric-acid ointment.

Cystitis, which occasionally occurs, is best treated by washing out the bladder with a weak solution of sodium salicylate, and by giving this drug, or salol, or boric acid internally.

The supervention of **coma** in the diabetic is one of the most serious symptoms we can encounter, and is almost always fatal. Some authorities think that the occurrence of coma may be prevented, in cases in which it is feared, by the frequent exhibition of saturated solutions of alkalies—such as 4 drams of sodium bicarbonate and 2 drams of citric acid dissolved in 5 ounces of water and flavoured with a little saccharine and essence of lemon. This should be taken twice or thrice daily.

Those who believe the coma to be due to the absorption of toxines from the alimentary tract advocate free purging. Dr. Richard Schmitz, of Neuenahr, gives one or two tablespoonfuls of castor oil (even if there is diarrhœa) every hour; this brings away foul, black evacuations, and recovery, he says, often follows. Much, however, must depend on very early treatment, as soon as the first symptoms of such intoxication appear.

Those who believe that the coma depends on decreased alkalinity of the blood or on excessively thick blood, from the presence in it of a large quantity of sugar, advocate the dilution of the circulating fluid by the intravenous injection of alkaline-saline fluids. Dickinson, in one case, injected as much as 456 ounces of fluid in thirty-two hours, the fluid consisting of a solution of potassium chloride and sodium carbonate, phosphate and sulphate. The case ended fatally, but after a temporary recovery of consciousness. Fagge injected 26 ounces of a solution of sodium chloride and phosphate of sp. gr. 1020 with the same result—viz. temporary recovery of consciousness and a return of the coma after thirty-two hours and death. A 3 per cent. solution of sodium bicarbonate has also been used for the same purpose. Chadbourne (quoted by Osler) collected seventeen cases of intravenous injections in diabetic coma; in only one was there complete recovery, and seven experienced temporary improvement. This is not a very encouraging result; but still, if one life in seventeen can be saved by such a measure, it ought not to be neglected.

Two model dietaries for the diabetic are appended, others will be found in the author's work on "Food in Health and Disease."

Seegen's Dietary.

SANCTIONED:

In any quantity:—Flesh of all kinds: preserved (smoked) meats, ham, tongue, bacon; fish of all kinds; oysters and shellfish; crabs, lobsters; animal jellies; aspic; eggs, caviare, cream, butter, cheese; spinach, cooked salads, endive, cucumber, green asparagus, watercress, sorrel, artichokes, mushrooms; nuts.

In small quantity:—Cauliflower, carrots, turnip, white cabbage, green beans; *berries,* such as *strawberries, raspberries, currants;* also oranges and almonds.

BEVERAGES:

In any quantity:—Water, soda-water; tea, coffee; Bordeaux and Rhine and Moselle wines; Austrian and Hungarian table wines. In short, all wines that are not sweet, and that contain only a moderate amount of alcohol.

In very small quantities:—Milk, unsweetened; almond emulsion; brandy, bitter beer; lemonade, unsweetened.

FORBIDDEN:

Farinaceous foods of all kinds; (*bread only in very small quantity according to the discretion of the physician;*) sugar; potatoes, rice, tapioca; arrowroot, sago, groats; peas, beans; sweet fruits, as grapes, cherries, peaches, apricots, plums, and all kinds of dried fruits.

BEVERAGES:

Champagne and sweet wines and beers, must, fruit wines and fruit juices and syrups; sweet lemonade; liqueurs; ice and sorbets; cocoa and chocolate.

Sir W. Roberts's Dietary.

SANCTIONED:

Butcher's meat; poultry and game; fish; cheese; eggs: butter, fat, and oil; broths, soups, and jellies, made without meal or sugar; cabbage, endive, spinach; broccoli, Brussels sprouts; lettuce, spring onions; watercress, mustard and cress; celery.

Substitutes for bread:—Bran-cake, gluten bread (and meal), almond meal, rusks and biscuits; "torrified" or charred bread.

BEVERAGES:

Dry sherry, claret, bitter ale; brandy and whisky (in small quantities); tea, coffee (no sugar), chocolate (made with gluten meal), soda-water, bi-tartrate of potash water.

FORBIDDEN:

All saccharine and farinaceous foods; bread, potatoes; rice, tapioca, sago, arrowroot, macaroni, etc.; turnips, carrots, parsnips, beans, and peas; liver (contains much sugar-forming substances), and therefore oysters, cockles, mussels, all containing enormous livers; the "pudding" of crabs and lobsters; *all sweet fruits*, as apples, pears, plums, gooseberries, currants, grapes, oranges, etc.

BEVERAGES.

Port and all sweet wines; sweet ales and porter; rum and sweetened gin.

ADDITIONAL FORMULÆ.

Lactic acid mixture.

℞ Acid. lactic., 15 to 30 grains.
Aquæ, 3 oz.

M. f. mist. To be taken in tablespoonful doses every half hour after each meal (thrice daily). (*Cantani.*)

Mixture for diabetes.

℞ Syrup. calcii lacto-phosp., 4 oz.
Liq. arsenicalis, 1 dram.

M. f. mist. A dessertspoonful three times a day. (*Bartholow.*)

Lithium pills for diabetes.

℞ Lithii carbonat., 30 grains.
Sodii arseniat., 1 grain.
Extr. gentianæ, 15 grains.

M. et divide in pil. 20. A pill night and morning. (*Vigier.*)

Iodoform pills for diabetes.

℞ Iodoformi, 15 grains.
Extr. lactu carii sativi, 15 grains.
Cumarin, 1½ grain.

M. et divide in pil. 20. One three times a day. (*Moleschott.*)

Mouth wash for diabetics.

℞ Boracis, 1 dram.
Potassii chlorat., 1 dram.
Glycerini, 1 oz.
Mucilaginis acaciæ, 1 oz.
Aquæ ad 8 oz.

M. f. lotio. (*Packard.*)

Anti-diabetic syrup.

℞ Antipyrin, 150 grains.
Saccharini, 3 grains.
Sodii bicarb., 2 grains.
Infus. caffcæ, 5 oz.

M. f. mist. A tablespoonful twice or thrice daily. (*Bardet.*)

Part IX.

SPECIFIC INFECTIVE DISEASES.

CHAPTER I.

THE TREATMENT OF DIPHTHERIA AND WHOOPING COUGH.

DIPHTHERIA—A *Bacillary* Disease and a *Local* Disease—Nature of Infective Process—Characters of the Klebs-Loeffler Bacillus—Etiology of Diphtheria—Modes of Contagion—Symptoms and Course—Pharyngeal, Nasal, and Laryngeal Forms—Constitutional Symptoms—Complications—Paralyses—*Indications for Treatment*—*Local Measures*—Antiseptic Applications—Caustics injurious—Warm Irrigations—Sprays—Paints—Corrosive Sublimate—Carbolic and Alkaline Spray—Other Local Remedies—*Internal* Medication—Perchloride of Iron—Sodium Benzoate, and other Drugs—Food and Stimulants—Treatment of Nasal Form—Of Laryngeal Form—Emetics—Operative Measures—Intubation—Tracheotomy—Treatment of Convalescence—Of Diphtheritic Paralysis—Strychnine—Massage—Electricity—Prophylactic Measures.

WHOOPING COUGH—Nature, Characters, and Symptoms—An Infective Bacillary Disease—Indications for Treatment—(1) Antiseptics—(2) Anti-catarrhal Remedies—(3) Sedative Remedies——Maintain Nutrition by suitable Feeding—Change of Air——Prophylaxis. Additional Formulæ.

THE TREATMENT OF DIPHTHERIA.

So much light has been thrown on the nature of this formidable and increasingly prevalent disease by recent bacteriological research, that it is necessary we should occupy a brief space in setting forth such facts as have been thoroughly established in connection with its natural history, before we attempt to formulate indications for its treatment.

In the first place, it has been proved beyond question that diphtheria is a **bacillary** disease, and that its effects are due to the operations of a specific micro-organism; and in the second place, it has been established that it is primarily a *local* disease, a local infection, and that the constitution is *secondarily* affected by the absorption of toxic substances developed by the activities of a specific micro-organism at the seat of local infection.

The specific organism which causes diphtheria is known as the Klebs-Loeffler bacillus, from having been first described by those observers. Roux and Yersin in France, and Sidney Martin in England, have thrown much light on the nature of the processes by which it infects the organism it attacks. This bacillus is found in the membranous exudation—the "false membrane"—but not in the subjacent mucosa, nor in the blood or tissues of the body. As soon as this fact was established, it became clear that the grave constitutional symptoms of this disease were not caused by the presence of the specific organism in the blood or the tissues; but, if this organism were the true cause of the disease, they must depend upon the absorption of some toxic substances developed by the agency of the bacillus at the focus of infection. The real nature of this process has recently been made clear.

The Klebs-Loeffler bacillus appears in the form of straight or slightly bent rods with rounded ends. Some present a club-shaped expansion at one end like a drumstick. They are often packed close together in little clumps. They can be stained by Gram's method. This bacillus can be cultivated on *bouillon*, on blood serum, on potato, and on boiled white of egg. It multiplies freely in milk. It forms no spores, but is of very persistent vitality, and cultures have been made from diphtheritic membrane that has been preserved in a dry cloth for five or six months.

Toxic substances have been extracted from cultures of this bacillus by Loeffler, by Roux and Yersin, and by Martin, all of which have been found capable of producing constitutional symptoms identical with those of diphtheria. Martin describes three sets of poisonous substances obtainable from pure cultures of the specific organism of diphtheria—an organic acid, an albumose, and a ferment-like body.

"In the diphtheritic membrane . . . the organism is growing on coagulated fibrin, a substance which is readily digested by and prepared for the nutrition of the organism." In this membrane "albumoses are always found accompanied by an *extremely virulent substance entangled in the proteid of the membrane* and precipitated by alcohol. This substance is similar in all respects to the *ferment-like* body described by Roux and Yersin. It is attenuated by heat, destroyed by boiling, and is characterised by the same (but more intense) physiological action as the albumose and the organic acid, extremely minute doses producing very grave symptoms. Diphtheria, then, is entirely dependent for its specific symptoms on the diphtheria bacillus . . This bacillus does not readily attack healthy individuals, but when there is slight ulceration of the throat or slight fibrinous exudation on the surface of the tonsil or the posterior surface of the velum palati, diphtheria often makes its appearance . . usually the diphtheritic process appears to be grafted on small patches of ulceration and exudation . . This bacillus does not appear to have a very marked power of attacking healthy mucous membrane; but when it finds a nidus in devitalised cells or coagulated fibrin, it is able to produce its special secretion or 'enzyme,' part of which acting on the fibrin, just as the 'enzyme' met with in the stomach acts on food, rapidly transforms the insoluble and undialysable fibrin into soluble albumoses, some of which in time are utilised for the nutrition of the micro-organism, whilst the remainder of the 'enzyme' and the products of its action on the fibrin, absorbed by the lymphatics and blood-vessels, are carried into the system"* and there poison certain tissues and organs.

It has been found by MM. Roux and Yersin—

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* Dr. G. Sims Woodhead, *British Medical Journal,* August 6, 1892, p. 287.

and this is an important observation—that the bacillus of diphtheria often remains in the mouth after the disappearance of the false membranes, and they have found it there even fourteen days after the throat had returned to its normal state. They consider this is more likely to be observed in cases that have not been accurately diagnosed and therefore not properly treated, and that these lingering bacilli may be the cause of reinfection and of *relapses*, if from chill or any other cause the mucous membrane becomes diseased and so offers a suitable soil for fresh cultures.

The *danger* of *contagion*, therefore, does not disappear with the disappearance of the local manifestations, and isolation must be maintained for some time afterwards, and such precautions taken as we shall subsequently detail, before such patients are allowed to mix again with their fellows.

Roux and Yersin make another important statement, to which we shall again refer—viz. that the diphtheritic virus, although very resisting in the dry state, *cannot support even for a few minutes a temperature of* 58° C. (about 137° F.) without being destroyed.

Another bacillus identical in form and in its behaviour in culture media to the true bacillus of diphtheria, but without its virulence, has been found in some forms of membranous sore-throat and has been termed the *pseudo-diphtheria bacillus.* Roux and Yersin believe they have established the complete identity of these two forms, and they have succeeded in attenuating the virulence of the true organism by cultivating it at a temperature of 40° C. in a current of air, so as to be identical in every respect with the pseudo-diphtheritic microbe. It is possible, although it has not yet been demonstrated, that this latter form, in certain circumstances, acquires a virulent quality and becomes converted into the *true* infective and contagious diphtheria bacillus. If this should be established, it will prove a very important fact in the life-history of this contagion, for these observers found the pseudo-bacillus (or the attenuated true bacillus?)

very widely diffused. On examining the mouths of fifty-nine healthy children in a school in a healthy situation by the sea, where no cases of diphtheria had for a long time been known, they found this bacillus in twenty-six of them! It seems probable that in some instances, it only needs the influence of some intercurrent malady to render these bacilli virulent and infective.

With regard to the **etiology** of diphtheria, it is known to be a highly *contagious* disease, and conveyed widely from infected persons to others. It is difficult, however, to say in what manner it originates. Has it any relation to defective drainage? It has been suggested that exposure to emanations from drains may excite a non-infective sore-throat, which may serve as a suitable soil or culture ground for the diphtheria germ, when present in the air; or, as Roux and Yersin's observations suggest, it may confer an infective virulence to non-infective pseudo-bacilli already in the mouths of certain children and thus the disease may be started. Unlike many other contagia it has never been definitely traced to water pollution.

There is no reason to believe that the virus can be conveyed by the breath of an infected patient; but by acts of coughing and spluttering when the throat is being examined and dressed, and by the discharge of saliva and buccal mucus from the mouth, or infective discharges from the nose, the virus is scattered about on the bed-clothes, and on persons and articles of dress and furniture near the patient. Thus it happens that it has proved the most fatal of maladies to medical attendants and nurses. The virus may attach itself with great tenacity to articles of furniture, curtains, carpets, etc., in the room in which the patient has been laid up. It would seem to be communicable from certain animals to man. Cats appear to have conveyed the disease to children, as these animals are subject to a similar pseudo-membranous affection; and the same has been observed of calves; and the milk of a cow, with a calf so affected, might accidentally contain some of the virus and so be the source of contagion.

Childhood is a predisposing cause to this as it is to most infective diseases. It has been found most fatal between the second and sixth year. An unhealthy condition of the mucous membrane of the mouth and throat, enlarged tonsils, chronic naso-pharyngeal catarrh, inflamed gums from carious teeth, etc., predispose to infection. Like some other infective diseases, such as scarlet fever, epidemics vary greatly in their severity. In some the infective agent appears to be very virulent and spreads rapidly, and the constitutional symptoms assume great gravity; in others the disease runs a mild course and is rarely fatal.

The clinical course and the **symptoms** of the disease vary with the severity of the attack. The onset is generally marked by some difficulty in swallowing, redness of the fauces, and general febrile manifestations, with rise of temperature often to 103° or higher. The characteristic exudation usually appears first on the tonsils, and may not be distinguishable immediately from that of follicular tonsillitis. The false membrane, however, soon extends, covering the tonsils and stretching to the pillars of the fauces, to the uvula, and often to the posterior wall of the pharynx.

The tonsils and the uvula and the mucous membrane covering the throat, at the same time, become swollen and œdematous, and the glands in the neck also often become enlarged and tender. The pseudo-membrane has at first a greyish-white aspect, but it soon assumes a dirty or yellowish-grey appearance. The membrane is firmly adherent, and if removed leaves a raw bleeding surface on which fresh exudation rapidly reappears. In favourable cases, after the fourth or fifth day, the severity of the symptoms abates, the false membrane separates and is not reproduced; the swelling of the throat is reduced, and the enlarged glands in the neck become smaller, the febrile temperature disappears and convalescence may be fully established by the ninth or tenth day. But in other cases the disease runs a more formidable course; the false membrane may extend from the pharynx along the posterior nares into the nasal cavities, and set up *nasal* in addition to pharyngeal diphtheria, and this is attended by a foul acrid discharge from the nose, and much obstruction to respiration from swelling of the nasal mucous membrane. The disease may even extend to the conjunctivæ through the lacrymal ducts, or to the middle ear along the Eustachian tube, or it may even attack the skin. But the most serious extension of the false membrane is downwards into the larynx; thence it may spread into the trachea and even into the larger bronchi.

Laryngeal diphtheria is attended by the same symptoms as membranous **croup.** and there is a very general disposition to regard cases of so-called membranous croup as really cases of laryngeal diphtheria. The symptoms now become very serious and urgent. Owing to obstructed respiration, the breathing is noisy and stridulent, the inspiration shallow and rapid, and the sternum and lower ribs and intercostal spaces are retracted in inspiration; the surface becomes cyanosed, and if the embarrassed respiration is not speedily relieved the child dies asphyxiated.

In some cases the symptoms of grave constitutional infection appear early and take the more prominent place. More generally they correspond in severity with that of the local manifestation and appear later. There is in these cases great prostration, with high fever, a small, feeble and rapid pulse, marked disturbance of the nervous system, delirium, convulsions, etc., and the patient often sinks rapidly from the intensity of the constitutional infection. When these constitutional symptoms appear *later*, they are usually associated with extensive disease of the pharynx, sloughing, fœtid ulceration, and sometimes even gangrene, together with great enlargement of the lymphatic glands and an ashen-grey pallor of the countenance. Many variations from this general sketch, which is simply intended to lead up to therapeutic indications, will be encountered.

We have yet a few words to say with regard to the chief complications. Infective bronchitis and broncho-pneumonia, and even pulmonary gangrene and fatal hæmorrhage, may occur in the graver forms of this disease. *Albuminuria* of the ordinary febrile type is present in all severe cases; but in a few it may be abundant and dependent on the occurrence of parenchymatous nephritis. One of the most serious complications and sequels of diphtheria is *paralysis.* Sometimes it appears early in the disease, but more usually not before the second or third week of convalescence, and it is apt to follow mild as well as severe cases. It commonly begins in the palate and gives a nasal character to the voice, and allows of the regurgitation of fluids taken into the mouth through the nose. If the paralysis extends to the pharyngeal muscles, swallowing may become difficult. The ocular muscles may be paralysed, giving rise to strabismus, ptosis, and failure of accommodation. Loss of power may also appear in the extremities. The most serious form of diphtheritic paralysis is that affecting the heart muscle, manifested by great irregularity and often remarkable slowness of the pulse, and ending sometimes in fatal syncope. Multiple forms of paralysis occasionally occur and the patient is rendered entirely helpless. These various forms of paralysis are regarded as dependent on a toxic neuritis.

Being in possession of the foregoing facts as to the nature and characters of diphtheria, we are now in a position to establish rational **indications** for its **treatment.**

1. The first and most important indication is to destroy, or attenuate the virulence, and prevent the extension of the infective organism, at the seat of infection. The disease must be attacked *locally,* as quickly and as thoroughly as possible.

2. The next indication is to support the constitutional vigour, and so help the system to resist the toxic

influence of the infective products of the diphtheria bacillus should they be absorbed. In the *later* stage of serious cases when the signs of constitutional infection are obvious, this becomes the paramount indication.

3. A third indication is to adopt measures to prevent the communication and spread of the disease. Other subordinate symptomatic indications arise in the course of the disease; such as the removal of respiratory obstruction in laryngeal cases, by operation if necessary, and the treatment of the paralysis which so frequently occurs as a sequel in this disease.

We will, in the first place, consider the kind of **local treatment** best calculated to fulfil the first indication; and the success of our efforts will depend, not so much on the particular medicinal agents we may employ—for we certainly have many effective ones at our disposal—as on the vigour and thoroughness with which they are applied and the opportunity we may be afforded of applying them *early.* To ensure success, **early** application of antiseptic measures is of chief importance. In the *early* stage the poison is probably quite superficial and can be effectively destroyed by suitable antiseptic applications. But if the local disease has existed for some days before these are applied, there has been time then for the constitution to become affected by those virulent products which, we have seen, are elaborated at the seat of infection; and it is altogether a far more difficult and uncertain task to attack these poisons in the blood and tissues. The extension also of the local morbid process into the air-passages, is far more likely to occur, when there has been any neglect of vigorous early treatment of the pharyngeal manifestations, and it is this particular complication that proves so very fatal, not only because of the respiratory obstruction it produces and the serious operations for its relief necessitated, but probably because, in these cases, the constitutional infection is more intense, and the infective virus has reached a tract of mucous membrane which is more out of reach of our local remedies.

The **local** treatment should consist in the frequent and thorough application of **antiseptic** agents. The strong hydrochloric acid which used to be applied locally by Bretonneau owed its success, no doubt, to its antiseptic action, and not to its caustic effects, for we have learnt that caustics are injurious and should be avoided. They favour the extension of the false membranes by the injury they do to the adjacent sound mucous membrane, which they denude of its protective epithelium and irritate and inflame, and so produce a condition favourable to the attack of the infective microbe, and by provoking reactionary tumefaction they aggravate the dysphagia already existing. All caustics must therefore be avoided.

At the same time an antiseptic application must be used of sufficient strength to be really efficacious. It is folly to discuss whether we shall use a 1 or 2 or 3 per cent. solution of some antiseptic agent when such serious consequences are at stake. We should use it in as strong a form as we safely may. Many antiseptic agents fall into discredit from the feeble and inefficient manner in which they are applied.

If we can detach, and remove or wash away, the false membrane while making our antiseptic applications, it is certainly advantageous to do so; but no violence should be used, and the idea of applying solvent or digestive agents for its removal has lost much of its force since it is known that the virus is superficial and in the membrane itself, and that it does not extend into the subjacent mucosa.*

It is as well to remember that the virulence of the diphtheria poison is attenuated by moist heat and destroyed at a temperature of 137° F. We should therefore use our applications as hot as they can be borne without injury to the mucous membrane.

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* The substances that have been used to dissolve the false membranes are lime water, lactic acid (five per cent. solution), solutions of pepsin and of papain, lemon juice, solution of neurin (Ludwig), solutions of chlorate of potassium and chlorate of sodium, and peroxide of hydrogen.

Vigorous **irrigation** with hot water or hot aqueous solutions of borax, or boric acid, or potassium chlorate is one of the best mechanical means of detaching and washing away the false membrane. The following is a useful solution for irrigation, and as it is quite free from toxic properties it may be used very freely :—Borax, boric acid, of each 2 drams, chlorate of potash 1 dram, glycerine 4 ounces, hot water a pint.

These irrigations should be made frequently, with a large syringe, capable of giving a strong jet of fluid. If we have to do with an infant or a restless young child, it is best to wrap its body and arms tightly in a shawl so that it cannot struggle, and for the nurse to hold it on her knees with its head firmly supported on her chest. Another assistant should hold a basin under the child's chin. The nose must be pinched, and as soon as the child opens its mouth a piece of wood should be placed between the molars, and then the nozzle of the syringe or irrigator should be directed with a strong jet to every point of the throat and fauces. After the throat has been thus cleansed (adults can use the hot fluid as a gargle for the same purpose) the stronger antiseptic agent we have determined to employ may be applied by means of a pulverising apparatus (and this is best if the nose or larynx should be attacked) or by means of a pledget of cotton wool firmly tied on to a piece of stick (to be burnt immediately after use). This is the best method of applying strong antiseptic agents, which we can not use, of the same strength, as a spray. One of the best local applications in pharyngeal diphtheria is the *perchloride of mercury ;* but it is usually used in too dilute solutions. Dr. Paul Le Gendre, who has had great experience in treating these cases in children, uses a 1 per cent. solution in alcohol and applies it by means of cotton wool, or a fragment of sponge, as we have advised ; this is dipped in the solution and the excess of fluid pressed out before it is applied to the throat. The application should be made three or four times a day, and by using a strong solution such as this, which is brought into contact only with the infected parts, very energetic antiseptic action is ensured. We have used an aqueous solution of 1 in 500 in the same way and very successfully. Others employ weaker solutions and apply them much more frequently, or use them as a spray (1 in 1,000 to 1 in 5,000 of water). In the latter case it should be used as hot as can be safely applied.

We prefer, however, to use the stronger solutions for pharyngeal cases, and to protect the air-passages from infective invasion we employ, at the same time, the following spray, which, by means of a Siegle's steam spray-producer, we keep playing in front of the child's mouth and nose (if very young and unable to inhale) as constantly as possible,—glycerine of carbolic acid, 6 drams, sodium bicarbonate, 60 grains, and hot water, 6 ounces. By a suitable contrivance the atmosphere around the child's head can be kept nearly saturated with this spray, which must thus enter, in some proportion, into its larynx and trachea.

One of the advantages of the alkali and the glycerine is that it enables the spray to **wet** thoroughly the mucous membrane with which it comes in contact.

Many other local applications have been employed with success, such as a saturated solution of boric acid, a 10-volume solution of peroxide of hydrogen,* strong solutions of potassium chlorate, chlorine water, the tincture of perchloride of iron diluted with 2 to 5 of water and glycerine, insufflation of sulphur, painting with tincture of iodine, with tolu varnish, with paraffin, with a 2 per cent. solution of creolin, etc., etc.

Vigorous local treatment should be accompanied by suitable internal remedies directed, especially to maintain the forces of the organism, and to enable it to resist the invasion of the toxic agents, developed at the seat of infection. The strongest testimony is borne, by a host of observers, to the efficacy of the internal administration of **perchloride of iron**; a part of this efficacy we believe to be due to its antiseptic action on the infected throat as it is swallowed. For a child of one year 2 minims and for a child of three years 5 to 10 minims of the tincture with 1 to 3 grains of potassium chlorate in a teaspoonful or two of syrup and water should be given every hour. Larger doses must, of course, be given to adults.

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* Warmly praised by Professor Cameron: Hare's "System Practical Therapeutics," vol. ii. p. 495.

For an adult or a fully-grown child the following is an excellent mixture :—

℞ Tinct. ferri perchlor.	160 minims.
Quininæ sulph.	24 grains.
Potassii chloratis	48 ,,
Succi limonis	6 drams.
Aquæ chloroformi	ad 8 oz.

M. f. mist. A tablespoonful with one of water every hour or two, according to the severity of the case.

Sodium benzoate is a useful medicine for internal use for children; its efficacy has been warmly supported by certain Continental physicians. The following is a formula for its administration :—

℞ Sodii benzoatis	2½ drams.
Syrupi aurantii	5 ,,
Aquæ menthæ pip.	3 oz.
Aquæ	ad 6 ,,

M. f. mist. A dessertspoonful every hour (for a child of three years). The dose is increased with the age of the child.

Sodium benzoate has also been used as an insufflation to the throat. The internal use of *biniodide of mercury* has been strongly advocated by Illingworth. Salicylic acid, sodium salicylate, turpentine, thymol, helenine, have all been credited with curative powers in the treatment of this malady.

Judicious *feeding* is an important element in the treatment of these cases ; fluid or semi-fluid foods only can be given, milk, nutritious broths and soups, beaten-up eggs, pounded meat mixed with light broth, coffee with milk, cocoa, and a due amount of alcoholic stimulant should be given regularly at stated intervals. Refractory children, or others, may be fed by the stomach tube introduced by the nose (unless there is nasal diphtheria) or enemata of peptones may be given. Any indications of cardiac failure must be met by an increase in the amount of wine or brandy, which should be given at short intervals, until the action of the heart improves. Small doses of digitalis may be needed, and hypodermic injections of ether, or of caffeine, dissolved in solution of sodium benzoate, should be resorted to in the graver forms.

Nasal diphtheria may arise primarily, but it is more commonly an extension from the pharynx into the posterior nares. Its occurrence usually indicates a severe form of the disease and the constitutional infection is apt to be severe. Irrigation and spraying of the nasal cavities must be diligently carried out with the carbolic acid and sodium bicarbonate spray we have already mentioned, or borax or potassium chlorate in weak solutions with glycerine may be used; or a weak solution of corrosive sublimate may be employed as a spray and an oro-nasal respirator worn, the sponge of which is kept saturated with turpentine or eucalyptol.

Laryngeal diphtheria may also be primary or secondary; more commonly, like the nasal form, it is an extension of the false membrane downwards from the pharynx.

When this serious complication occurs, with a child, its bed should be enclosed in a tent, and the enclosed space kept saturated with steam from a kettle provided with a long tube, as shown in Fig. 4. If a piece of sponge is attached to the end of the tube and kept moistened with turpentine, eucalyptol, or pinol, the air of the tent will become charged with these antiseptic vapours.

In these cases the maintenance of a hot spray of carbolic acid and sodium bicarbonate (as already formulated) playing in front of the mouth and nostrils by means of a large spray-producer, as shown in Fig. 4, is of the greatest service.

In very young children a piece of blotting paper or lint may be fastened on to the bib, or round the neck, and kept saturated with spirits of turpentine, pinol, or eucalyptol, so that the vapour may be continuously inhaled.

The internal administration of corrosive sublimate has been specially advocated when this complication threatens, and as much as half a grain has been given daily in divided doses to a child a year old. The usual dose is about $\frac{1}{100}$ grain every hour in milk. It must not be continued more than three or four days.

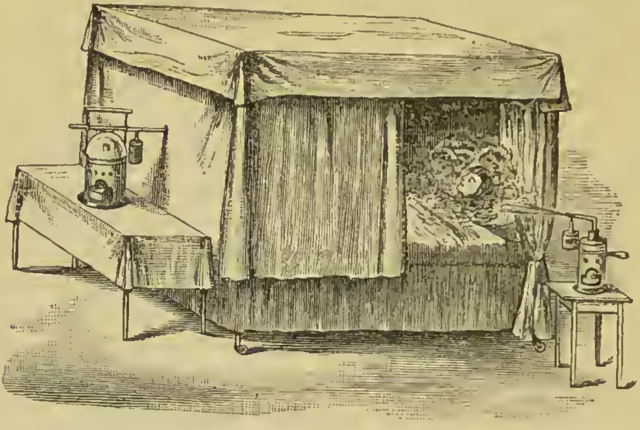

Fig. 4.—Tent with Spray Apparatus for Laryngeal Diphtheria.

Emetics are often prescribed at this stage to promote the expulsion of false membranes formed in the larynx and trachea, and sometimes with success; for this purpose ipecacuanha or sulphate of zinc may be used. Apomorphine is far too depressing an agent to be employed in this disease. Oertel has successfully passed a camel-hair brush, with an appropriate curved handle, into the larynx and moved it about so as to detach portions of false membrane which were usually coughed up afterwards. If this is attempted the brush should be first dipped into an antiseptic fluid, such as a 1 in 2,000 sublimate solution. The children he applied this method to were between five and eleven years of age, and it succeeded in three out of eight.

If vomiting fails to relieve, and the signs of respiratory insufficiency remain urgent, **tracheotomy** or **intubation** must be performed. It is not desirable to wait until the respiration has become greatly impeded before we operate, as the chances of recovery are greatly imperilled by delay. *Intubation* has not met with so much support in England as in Germany and America. So far as statistics show, the recoveries after either of these operations are about equal. It has been suggested that intubation is the preferable operation in the following circumstances: (1) in children under 3½ years of age, (2) in adults, (3) in the homes of poor persons, or whenever continuous skilled attendance is difficult to procure. It is unsuited to cases in which the trachea is probably crowded with membrane.*

The tubes inserted should be previously well soaked in hot antiseptic fluid, and the inner tracheotomy-tube should be removed every half-hour and similarly treated before its reintroduction, and the outer tube should be cleansed with a feather (to be immediately burnt) of any adherent secretions or fragments of membrane; it should be removed and cleansed after twenty-four hours. The atmosphere around the patient should be kept saturated with steam and antiseptic vapours as already described.

During **convalescence** great care in the management and feeding of the patient is needed. To avoid the danger of sudden attacks of syncope, the patient must be kept in the recumbent position, as much as possible, and not allowed to feed himself.

Nourishing food and stimulants must be freely given. Good sound port wine is the best stimulant during convalescence. Should symptoms of **paralysis** appear, the patient must be kept at rest and all exertion forbidden. If there is much difficulty in swallowing from pharyngeal paresis, it may be advisable to feed the patient with the stomach-tube. In the chronic cases electricity and massage may help in the restoration of the nutrition and power of the muscles.

For children gentle massage and friction are preferable, as they are alarmed and fretted by electrical appliances.

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* Detailed instructions as to the methods of performing these operations will be found in Mr. Treves's "Operative Surgery," vol. ii. p. 133 *et seqq.*

In applying electricity, the slowly interrupted current is the best—the negative pole being placed over or as near as possible to the affected muscles, and the positive pole at the back of the neck, if the muscles of the upper part of the body are affected, and over the lumbar region, when those of the lower limbs are involved. In regulating the current the object should be to excite muscular contraction without causing more pain than is unavoidable.

In cases in which recovery is long delayed the injection of small doses of strychnine into the muscles has been attended with much benefit. Dujardin-Beaumetz mentions a case in which there was serious loss of power of the diaphragm and other respiratory muscles, and in which improvement became at once manifested on the injection of $\frac{1}{30}$ grain of sulphate of strychnine. It must be remembered in estimating the value of remedies in diphtheritic paralysis, that it tends to disappear spontaneously in a few months, although it may sometimes persist much longer; but there can be no doubt of the value of strychnine as a cardiac stimulant in these cases, and we do not share Oertel's objections to its use.

It may be given in combination with iron and quinine as in the following formula, for an adult:—

℞	Ferri et quininæ citratis	80 grains.
	Liq. strychninæ	32 minims.
	Acid. hydrochlor. diluti	80 „
	Aquæ chloroformi	ad 8 oz.

M. f. mist. Two tablespoonfuls twice or three times a day, an hour after food.

Or the following for a child:—

℞	Syrupi ferri phosphatis	1 oz.
	Calcis hypophosphitis	48 grains.
	Quininæ sulph.	24 „
	Liq. strychninæ	48 minims.
	Acid. phosphorici dil.	24 „
	Aquæ	ad 4 oz.

M. f. mist. One or two teaspoonfuls, according to age, twice or thrice daily.

Should a patch of diphtheritic false membrane appear on the skin, as it may do occasionally from the bacillus falling on some abrasion of the surface, it should be removed by forceps and the raw surface well washed with a 1 in 1,000 sublimate solution, then covered with naphthol camphor (see formulæ), and a small piece of cotton wool fixed over it with collodion.

Finally, we have to consider the necessary **prophylactic** measures to prevent the extension of the disease to others.

In the first place, the patient with diphtheria must be strictly isolated, and other children in the house or family should be, if practicable, removed elsewhere. If this is not possible, they should be placed in a part of the house remote from the patient, and be made to use a disinfecting mouth wash three or four times a day, such as the following :—

℞ Potassii chloratis pulv.	2 drams.
Glycerini boracis	1 oz.
Acidi borici	2 drams.
Glycerini acid. carbolici	1 oz.
Aquæ menthæ pip.	ad 12 ,,

M. f. garg. To be shaken up and mixed with an equal quantity of hot water when used.

The danger of kissing and fondling children with diphtheria must be pointed out to parents and nurses.

It is also desirable for nurses and medical attendants to protect themselves from infection when making applications to the throat in these cases. This can be done by folding pieces of stiff paper into the shape of a large oro-nasal respirator, so as to cover the mouth and nose, and attaching it with elastic thread behind the ears on making such application, and it can be burnt immediately afterwards.

The room selected for the patient should be large and airy, and capable of thorough ventilation, and it should have an open fireplace. It is best at the top and the sunny side of the house, as it is more difficult to maintain effective isolation on the lower floors.

"Carpets, mats, curtains, ornaments, and all unnecessary articles of furniture should be removed. A sheet kept wet with disinfecting solution should be hung outside the door. Special attendants should be provided, and no others permitted in the sick-room. Dusters, towels, clothing, bedding, and utensils used in the room should be kept there and washed there, and not allowed to be carried through the house or used elsewhere. Soiled clothes, etc., should be covered with a boiling disinfectant solution before being taken from the room, and great care exercised in washing them. The discharges from the nose and throat (after gargling, etc.) should be received in an earthenware or glass vessel containing (hot) sublimate solution (1 in 5,000), or on pieces of clean, old, soft linen, which should be burned immediately. The evacuations should be received in glazed earthenware utensils containing sublimate solution (1 in 5,000). Cats, birds, dogs, or other household pets should not be allowed in the room, for they are often the means of spreading infection. The room should be kept clear of **flies**, for they, too, have been accused of bearing infective particles from room to room and from house to house."* The patient should not be given *books or journals or toys* that cannot be immediately destroyed. House-drains and waste-pipes must be carefully looked to; food must not be left in the sick-room uncovered and unprotected, and milk especially needs protection, as it is known to be most apt to absorb impurities from the air.

At the same time that the room is kept well ventilated, some vaporisable disinfectant should be diffused through the atmosphere of the apartment. The following has been recommended for this purpose: Carbolic acid and oil of eucalyptus, of each 6 drams, and spirits of turpentine 4 ounces.

A tablespoonful of this mixture may be put on a hot-water plate, or it may be vaporised more rapidly from the surface of boiling water in a suitable vessel kept heated by a spirit lamp under it. It must be borne in mind, as we have pointed out, in sketching the natural history of this disease, that the infective bacillus may remain in the mouth for some time after the false membranes have disappeared from the throat; a child, therefore, who is convalescent from diphtheria must be still kept for some time—four or five weeks—apart from other children, and during this time a disinfecting mouth wash should be regularly used. Whenever it is practicable the oral secretions should be submitted to bacteriological examination, to make sure of the absence of the organism of diphtheria. In the *nasal* form the acrid discharges from the nasal passages are apt to remain virulent long after the other symptoms have disappeared, and such children should be especially kept from contact with others, and it would be well that they should wear such an oro-nasal respirator as is figured in vol. i. p. 499, charged with the disinfecting fluid just named; being made of perforated zinc, these respirators can be soaked in boiling water frequently and a fresh sponge or fresh cotton wool provided for the disinfectant.

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* Professor Cameron, M.D., in Hare's "System of Practical Therapeutics," vol. ii. p. 491.

Another important precaution, for the purpose of preventing the development and spread of this disease, is to cause all persons with acute anginal attacks, whether pseudo-membranous or not, to use antiseptic gargles or sprays, especially at times when diphtheria is prevalent. Much may undoubtedly be done by careful measures of isolation and disinfection, founded upon our present knowledge of the natural history and characters of this disease, to hinder its spread and development.

Whooping Cough.

This epidemic, infective disease is characterised by a catarrhal condition of the air-passages, attended by a peculiar paroxysmal cough, often of great violence and intensity. The cough characteristic of this disease comes on in paroxysms, and consists of a series of rapid, short, explosive, expiratory efforts, and then a long-drawn, loud, *whooping* inspiration; this is repeated several times, according to the severity of the paroxysm, and usually ends with a more or less abundant discharge of extremely tenacious, viscid, stringy mucus, and at the same time the contents of the stomach are often expelled by vomiting. These paroxysms occur with varying frequency; in slight cases perhaps not more than three or four times in twenty-four hours, but in severe cases they recur with alarming frequency, even fifty to sixty attacks during the day and night, being usually more frequent at night. The child learns to dread those attacks and often runs to its mother or clings to its nurse when it feels the attack coming on.

In prolonged and violent paroxysms the child becomes cyanosed, its eyeballs protrude, the face and neck become swollen, the conjunctivæ injected or even ecchymosed; blood occasionally pours from the nose, and sometimes appears in the expectoration; in rare instances the tympanum is ruptured and blood may be discharged from the ear. Convulsions are not uncommon in infants, and cerebral hæmorrhage has been known to occur. As may readily be imagined, the frequent and long-continued succession of these violent, convulsive, expiratory efforts is apt to lead to injury of the pulmonary tissues; bronchitis and broncho-pneumonia with lobular collapse are frequent sequels, and pulmonary emphysema (the air sometimes escapes into the subpleural areolar tissue, and the emphysema may become general) is developed, and may remain and cause habitual shortness of breath in after-life. Even pneumothorax has been known to occur. The bronchial glands are frequently enlarged (probably from an extension of the infective poison to them) and become caseous, and pulmonary tuberculosis is not an infrequent sequel of this disease.

Small ulcers have been observed to form under the tongue near the frænum, and are supposed to be caused mechanically, during the severe paroxysms, by the frænum of the tongue being thrust against the lower incisors.

Whooping cough is usually a disease of infancy and childhood, but it occasionally occurs in adults and even in aged persons. It is one of the most formidable diseases of early life, and, next to scarlet fever, is the most fatal of the infective diseases to which infants and young children are exposed. It is highly contagious, and one attack usually proves protective from others. This infection can certainly be conveyed from one child to another by an uninfected person who has been in contact with the sick child. It is probably conveyed in the clothes or perhaps the hair, and domestic pets, dogs, cats, etc., may also undoubtedly be the means of spreading the contagion. The characteristic paroxysmal cough is usually preceded by ordinary bronchial catarrh and coryza with slight feverishness, and the occurrence of these symptoms in a child, especially if the cough is unusually frequent and obstinate, when the disease is known to be epidemic, should induce us to regard and treat the disease as whooping cough. Indeed, it sometimes happens that the characteristic cough never appears.

If allowed to run its course it lasts from six weeks to eight months, the paroxysms of cough gradually lessening in violence and the expectoration becoming looser and more puriform. Its incubation period would seem commonly to be about fourteen days, but it may be much shorter. Whooping cough is singularly prone to follow measles. Unlike other infective diseases, there is generally an absence of fever during the characteristic stage, and the child may appear quite well between the paroxysmal attacks.

As to the nature of this disease, all analogy points to the probability that it is dependent on an infective micro-organism. Several organisms have been found in the expectoration and cultivated; but it is doubtful whether the true virulent microbe has as yet been isolated. A short bacillus growing with well-marked characters has been isolated and cultivated by Afanassjew, and when inoculated into the trachea of animals it has been found to produce a catarrhal condition; but it must be extremely doubtful whether it is possible, supposing we possessed the true organism of whooping cough, to produce in animals a disease which should be recognisable as the same disease as whooping-cough in the human subject. It is, indeed, quite possible that most animals may enjoy immunity from this affection.

In seeking for **indications for treatment** in this disease it must, we think, be admitted that those who have approached this subject, with the belief that the *first and most important* one is to endeavour to exert some *antiseptic* influence over the virus developed by a micro-organism in the air-passages, and possibly in the system, have met with *far better results* than those who have ignored that obvious indication.

Another indication is to endeavour to render more fluid and less viscid and adherent the expectoration, the bringing up of which, often in considerable quantity, usually terminates the paroxysm. It seems reasonable to suppose that if we could lessen the tenacity of this secretion so that it could be readily expelled, we should thereby shorten the paroxysms of cough and lessen their intensity. A third indication is to quiet nervous excitement and spasm.

The remedial treatment of whooping cough is thus clearly and rationally threefold: (1) Antiseptic, (2) anti-catarrhal, and (3) sedative.

(1) Our own experience has convinced us of the great value of **carbolic acid inhalations** in the treatment of this disease. But it is better not to use them at all than to use them, as many do, in a wholly inadequate manner. The child or children should be placed in a small or moderate-sized bedroom containing an open fireplace; a large iron dripping-spoon should be kept by the fireside and made hot from time to time, and carbolic acid vaporised by putting a teaspoonful or two into the heated spoon. The room, by

this means, soon becomes filled with carbolic vapour, and it should be strong enough to make the atmosphere unpleasant to others, and this has the further advantage of keeping members of the family out of the room who are not wanted there.

The nurse should be instructed to keep up this impregnation of the atmosphere with carbolic acid fumes night and day. Moreover, for *direct* inhalation we use, every hour or two, for fifteen minutes at a time, a spray of 1 dram of glycerine of carbolic acid and 10 grains of sodium bicarbonate to each ounce of hot water. However young the child may be, there is no difficulty in keeping this spray constantly playing in front of his mouth and nose, so that he is compelled to inhale it—in part at least (as shown in Fig. 4). In addition to this we cause a warm spray of a 5 per cent. solution of carbolic acid to be frequently diffused through the air over and around the patient's bed. A large Siegle, or some modification of Siegle's, steam spray-producer should be employed for this purpose. With very young infants who cannot inhale we have often caused the pharynx and fauces and upper part of the larynx, so far as accessible, to be brushed twice a day with glycerine of carbolic acid, and sometimes with surprisingly good results.

Thorner, Bouchard, Birch-Hirschfeld and Oertel, have been warm advocates of this method, and it has been widely adopted in England. Oertel says: "I have tried carbolic acid and certainly obtained more favourable results than with the methods hitherto employed. The youngest of these patients was my own little daughter, 1¼ year old, who was laid low by the most violent symptoms, rapidly succeeding paroxysms and fits of coughing. Inhalations of a 5 per cent. solution of carbolic acid were ordered in the following manner:—A small space about 1½ metre in diameter in the child's room was shut in by Spanish screens, and washstands hung with carpets and cloths; the child and her nurse were placed in this, and a 5 per cent. solution of carbolic acid was pulverised for an hour, at a distance of about one metre. The treatment was repeated four times in the day, while the child was kept the rest of the time partly in the same space, partly in the same room. On the first day of the inhalations the symptoms increased, and on the second reached their climax. From that time there was a rapid decrease of them; the paroxysms diminished in number and in violence; the frequent vomiting which had already disturbed the child's nutrition became less frequent and disappeared, together with the paroxysms, after eight days' steady application of the inhalations of carbolic acid. Also the bronchitis, which persisted for about three weeks longer, decreased rapidly in intensity, and the child's general health improved from day to day."*

Like Oertel and Birch-Hirschfeld, we have never observed any ill effects from the action of carbolic acid. Still the urine should be regularly inspected, and if any discoloration occurs the inhalations should be suspended for twenty-four hours.

Dr. Suckling and others have given carbolic acid *internally* with good results. Suckling says the duration of the attacks has been shortened by one-half. He gives half a minim with three minims of glycerine in a little peppermint water for a child a year old, and increases the dose with the age of the child.

We give sodium benzoate internally in combination with sodium carbonate and ammonium chloride; this mixture exerts a very favourable effect on the paroxysms of cough, and renders the expectoration less tenacious and more fluid. The following is the formula we use:—

℞ Sodii benzoatis	... ...	72 grains.
Sodii bicarbonatis	... ...	48 ,,
Ammonii chlor.	... ...	24 ,,
Aquæ chloroformi	... ...	1 oz.
Aquæ anisi	... ... ad	3 ,,

M. f. mist. One to four teaspoonfuls, according to the age of the child, in a little hot milk, every four hours.

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* Oertel's "Respiratory Therapeutics;" Ziemssen's "Handbook of General Therapeutics," vol. iii. p. 321.

Professor Widerhofer, of Vienna, uses inhalations of solution of quinine (40 grains to 3 ounces of water), as well as inhalations of carbolic acid, and he also has the throat painted with a 5 per cent. solution of hydrochlorate of cocaine, which he considers especially serviceable in allaying the tendency to vomit. Professor Monti, of Vienna, also claims that great service is rendered by an inhalation of a 1 per cent. solution of carbolic acid, and he also uses inhalations of tar-water and sulphurous acid fumigations. The latter have been recommended by many. The patient is removed from his bedroom in the morning, and sulphur is then burnt in it in the proportion of 6 drams per cubic yard, the corridors and doors being kept shut for five hours. The room is then freely ventilated till the air can be breathed with safety; the child, in fresh clothes, is then brought back to the room and put to bed. It is said he sometimes awakes cured the next morning. The inhalation of ordinary coal gas, diluted with air until it becomes respirable, has been found very efficacious.

Bromoform is an antiseptic fluid which, according to recent reports, has manifested remarkable efficacy in the treatment of this affection. Senator, Löwenthal and others speak most highly of its effects. It is given in doses of from 2 to 4 drops, thrice daily, to children a year old; from 3 to 4 drops, three or four times a day, to those from two to four years of age, and from 4 to 5 drops to those from four to eight years of age, according to the frequency of the paroxysms. It is given mixed with syrup and mucilage. Care must be taken to keep the drug in the dark, in well-stoppered bottles, as it is decomposed by exposure to sunlight and then becomes useless. It is said to diminish the frequency and severity of the paroxysms, to prevent vomiting, and to shorten the duration of the disease; and even those who do not admit that it shortens the course of the disease confess that it greatly abates its severity.

Quinine in full doses has also been found to alleviate and shorten the course of the disease. A child a year old should take 1½ grain thrice daily, and one two years old twice as much, and so on. Thornton Parker gives ¼ grain to a grain in solution every two hours.

Other antiseptic methods will be found set forth in the formulæ at the end of this chapter.

(2) *Anti-catarrhal* and (3) *sedative* remedies are only directed to the relief of symptoms.

The benzoate of sodium mixture which we have already formulated is an excellent anti-catarrhal remedy, and by facilitating expectoration eases the paroxysms of cough. If the expectoration continues very tenacious notwithstanding, we should add to this mixture small doses, ½-grain and upwards, of potassium iodide. Professor Whitaker recommends this drug simply dissolved in peppermint water, ½ an ounce of each; of this mixture he gives from 2 to 5 drops in a dessertspoonful of milk three or four times a day. Bourboule water is a very useful expectorant and tonic in the catarrhal stage, which usually follows, for a time, the cessation of the paroxysmal attacks. A tablespoonful or more with an equal quantity of hot milk should be given three times a day. Bamberger recommends that some sodium bicarbonate should be dissolved in hot water sweetened with sugar and a mouthful given to the child the moment the attack comes on. Other anti-catarrhal remedies will be found amongst the formulæ.

Numerous are the *sedative* agents that have been directed to the relief of the nervous spasmodic element in this disease. Belladonna is, perhaps, the most popular of all, and has been given in quite large doses. We shall append approved formulæ for its use, but it is a drug we rarely ourselves prescribe in whooping cough.

The best and most reliable sedatives in this affection are morphine, chloroform inhalations, which have the advantage of being antiseptic as well as sedative, chloral and the bromides. Either of these remedies may be combined with others, but they must, of course, be given with great caution.

Morphine must not be given when there is much co-existent bronchial catarrh, and should be used only to allay the spasm and nervous restlessness, in severe cases, and especially for the nocturnal attacks. The following is a useful combination :—

℞ Morphinæ hydrochloratis	¼ grain.
Sodii bromidi	30 grains.
Aquæ laurocerasi	2 drams.
Aquæ chloroformi	ad 1½ oz.

M. f. mist. One to three teaspoonfuls for a dose, according to the age of the child.

Or chloral may be given in the following form :—

℞ Chloral. hydratis	16 grains.
Sodii bromidi	32 ,,
Aquæ chloroformi	ad 2 oz.

M. f. mist. One to four teaspoonfuls for a dose, according to age.

Dujardin-Beaumetz uses the following mixture to calm the cough when other means fail :—

℞ Potassii bromidi	30 grains.
Sodii bromidi	30 ,,
Ammonii bromidi	30 ,,
Syrup. chloralis	1 oz.
Aquæ	ad 4 ,,

M. f. mist. A teaspoonful, dessertspoonful, or tablespoonful mixed with the yolk of an egg, beaten up in a glass of milk, night and morning.

Chloral may also be given in rectal injections.

Chloroform may be inhaled pure from a cone of blotting paper, from 5 to 20 minims at a time, according to age; or it may be combined with an equal part of eucalyptol or spirits of turpentine, and inhaled from the sponge of an oro-nasal respirator. (*See* vol. i. p. 499.)

The application, three times a day, of a 5 per cent. solution of cocaine, brushed over the pharynx, palate, root of tongue, and as low down as possible, so as to allow a few drops of the solution to enter the larynx, if possible, has been found to have a very sedative effect.

The nutrition of the child must be carefully looked to. In the slighter attacks the child will usually be able to feed well in the intervals of the paroxysms, and it will only be necessary to see that its food is light, wholesome, and easy of digestion. But when the paroxysms of cough are frequent, and attended almost always by vomiting, how to maintain the nutrition of the child may become a difficult problem.

The food must, of course, be fluid, and as rapidity of digestion is important, it may be desirable to give it peptonised. A draught of peptonised milk with a few drops of brandy in it may therefore be given immediately that the vomiting attending the paroxysms is over; there will be a better chance then of its being absorbed in the intervals between the attacks. Some French physicians give black coffee to check the tendency to vomit. If this method fails we must have recourse to rectal feeding—at any rate as an auxiliary.

In protracted cases, and when the season is suitable, no measure answers better than change of air—change from the town to the country or to the seaside. In mild cases, and when there is not much bronchial catarrh, and in fine weather, out-of-door exercise may be permitted and encouraged.

With regard to prophylaxis, the only effectual prevention of the spread of the disease is isolation. As some children are often well and active in the intervals between the paroxysms, and as out-of-door exercise is frequently permitted, to maintain effectual isolation becomes extremely difficult or impossible. In these circumstances it is best that delicate and susceptible members of the family should be kept away from the patient, by removal from home, if possible. The sputum should be received in a vessel containing some disinfecting fluid and then poured into boiling water and buried; or it may be received on sawdust and burnt. Grown-up children with whooping cough should wear a respirator containing some volatile antiseptic.

ADDITIONAL FORMULÆ FOR DIPHTHERIA AND WHOOPING COUGH.

Sulphur mixture for internal use in diphtheria.

Precipitated sulphur, 3 drms.
Chocolate powder, 2 drams.
Oil of cinnamon, 2 or 3 drops.
Glycerine to 6 oz.

One or two teaspoonfuls for a dose. (*Knaggs.*)

Perchloride of mercury mixture for internal use.

℞ Hydrarg. perchlor., $\frac{1}{6}$ grain.
Sodii chloridi, 15 grains.
Pepsinæ, 15 grains.
Tinct. aconiti, 15 to 30 minims
Aquæ destill., 4 oz.

M. f. mist. A tablespoonful every hour. (*Robbe.*)

For internal use in diphtheria.

℞ Potassii chloratis,* 30 grains.
Syrupi aurantii, 5 drams.
Dec. cinchonæ ad 5 oz.

M. f. mist. A teaspoonful every two hours.

* The chlorate of potassium must not be used internally if there is albuminuria, on account of its irritating effect on the kidneys.

Large doses (3 or 4 grains) of *quinine* must be given if there is high fever.

For diphtheritic paralysis.

Mild faradisation of the affected muscles, country air, and the following :—

℞ Quininæ sulph., 10 grains.
Ferri carb. sacchar., 10 grns.
Sacchari alb., 30 grains.

M. et div. in pulv. 10. A powder twice a day.
(*Prof. Widerhofer, Vienna.*)

For internal use.

℞ Acidi salicylici, 1 to 2 drams.
Gum. tragacanth, 1 oz.
Syrupi simp., $\frac{1}{2}$ oz.
Aquæ flor.-aurant., $\frac{1}{2}$ oz.
Aquæ destill. ad 8 oz.

M. f. mist. A tablespoonful every two hours (alternately with perchloride of iron, if necessary).

Spray for use in diphtheria.

℞ Papainæ, 150 grains.
Acid. hydrochlorici diluti, 15 minims.
Hydronaphthol, 3 grains.
Glycerini, 3 drams.
Aquæ destill. ad 4 oz.

M. To be used with a pulveriser every half-hour at first, and then every hour. Its early use destroys rapidly the local focus of infection, and prevents constitutional infection.
(*Caldwell.*)

Spray.

℞ Acidi salicylici, 30 grains.
Glycerini, 2 oz.
Liquor. calcis ad 10 oz.

M. To be used as a spray every three or four hours.
(*Marwood, Victoria.*)

Local application.

℞ Acidi salicylici, 20 grains.
Spr. vini rect. (q.s. to dissolve it).
Glycerini, $1\frac{1}{2}$ oz.
Infus. eucalypti ad 4 oz.

M. f. pigm. To be frequently applied with a brush.
(*Jules Simon.*)

Ointment for nasal diphtheria.

℞ Sulphur. sublim., 1 dram.
Adipis ad 1 oz.

To be applied as high as possible after irrigation with boric acid solution. (*Jules Simon.*)

Glycerole of carbolic acid and camphor for local application in diphtheria.

Shake together a mixture of

2 drams of carbolic acid,
8 drams of camphor,
10 drams of glycerine,

and place it in a bath of boiling water for ten minutes. Allow to cool. A white, viscid liquid separates and accumulates on the surface. This is the glycerole of phenol and camphor. It has a powerful destructive action on the virus of diphtheria.

It may be applied once or twice a day to the throat, after having removed the false membrane as completely as possible with a plug of cotton wool; at the same time free irrigations of the throat should be made every hour with carbolic or naphthol water.

(*Chantemesse and Widal.*)

Helenine locally and internally.

A solution of *helenine* in sweet almond oil is applied to the false membranes, to which powdered camphor has been previously applied with the tip of the finger. This application, made every four hours on the first day of the disease, has been found to cure in twenty-four hours, but it is useless after the fifth day. Helenine is also given internally in doses of 1½ grain for children of six years of age. (*J. B. Obiol.*)

Gargle of Lactic Acid.

℞ Acid. lactic., 150 grains.
Syrupi aurantii, 1 oz.
Aquæ ad 8 oz.

M. f. gargar. (*Le Gendre.*)

Fluid for irrigation of pharynx and nose.

℞ Potassii chloratis, 80 grains.
Aquæ, 16 oz.

M. f. solut. At the same time apply pure *lactic acid* to the false membranes twice a day. (*Widerhofer.*)

Application of carbolic acid and camphor.

℞ Acidi carbolici, 80 grains.
Camphoræ, 320 grains.
Ol. olivæ, 1 oz.

M. (*Soulez.*)

Naphthol camphor for local application.

℞ β-Naphthol, 1 dram.
Camphor, 2 drams.

M. (*Bouchard.*)

Carbolic solution for local application.

℞ Acidi carbolici, 1 dram.
Alcohol, 4 oz.

M. (*Loeffler.*)

Mixture for whooping cough.

℞ Acidi carbolici, 3 grains.
Sodii bromidi, 45 grains.
Tinct. belladonnæ, 20 mins.
Glycerini, 2½ drams.
Aquæ destill. ad 2 oz.

M. f. mist. A teaspoonful every two or three hours (for children of three or four years). (*Beall.*)

Inhalation in whooping cough.

℞ Thymol, 20 grains.
Acid. carbolici, ½ oz.
Eucalyptol, 2 drams.
Picis liquidæ, 2 drams.
Olei sassafras, 2 drams.
Spr. terebinth., 2 drams.
Ætheris, 1 dram.
Spr. vini rect. ad 3 oz.

M. f. inhal. Drop about 30 drops on a napkin fixed round the child's neck, and renew every two or three hours.
(*Beall.*)

Spray for diffusion through the apartment.

℞ Olei eucalypti, 2 oz.
Olei terebinthinæ, 1 oz.
Thymol, 1 dram.
Spiritus lavandulæ ad 6 oz.
M. f. solutio. (*Whitla.*)

Inhalation.

℞ Spirit. terebinthinæ, 2½ drms.
Spirit. ætheris, 2 oz.
Chloroformi, 1 oz.

M. f. inhal. A dessert-spoonful to be inhaled from folded lint during the attack.
(*Wilde.*)

Expectorant mixture.

℞ Vini ipecacuanhæ, 5 drams.
Spr. ammoniæ aromat., 3 drams.
Tinct. scillæ, 2 drams.
Tinct. camphoræ comp., 4 drams.
Syrupi tolu, 1½ oz.
Aquæ chloroformi ad 4 oz.

M. f. mist. A teaspoonful four times a day in a little water. (*Whitla.*)

Belladonna and quinine powders.

℞ Pulv. rad. belladonnæ, 1½ gr.
Quininæ sulph., 8 grains.
Sacchari albi, 30 grains.

M. et divide in pulv. 10. One three times a day.
Widerhofer.)

Spray for whooping cough.

℞ Cocainæ hydrochlor., 10 to 15 grains.
Potassii chloratis, 3 grains.
Aquæ ad 1½ oz.

M. f. sol. To be sprayed into the throat twice a day.
(*Græffner.*)

Nasal insufflations.

Boric acid and dried and finely powdered coffee, in equal parts, blown into the nostrils by a proper nasal insufflator, has been attended by excellent results. Powdered benzoin has been used in the same way.
(*Guerder.*)

Another.

℞ Pulv. benzoini, 75 grains.
Bismuthi salicyl., 75 grains.
Quininæ sulph., 15 grains.

M. f. pulv. For insufflation.
(*Moizard.*)

Liniment for the chest during convalescence.

℞ Olei eucalypti, 2 oz.
Linimenti camphoræ, 2 oz.
Olei cajuputi, ½ oz.
Olei menthæ pip., 2 drams.

M. f. linimentum. (*Whitla.*)

Chloral and bromide mixture.

℞ Chloral hydrate, 15 to 45 grains.
Potassii bromidi, 75 grains.
Syrupi aurantii, 3 drams.
Aquæ destill., 2 oz.

M. f. mist. A teaspoonful every two hours. (*Widerhofer.*)

Quinine and soda powders.

℞ Quininæ hydrochlor., 6 to 12 grains.
Sodii bicarb., 20 grains.
Sacchari albi, 20 grains.

M. et divide in pulv. 10. A powder every two hours.
(*Monti.*)

Benzoate of sodium mixture.

℞ Sodii benzoatis, 75 grains.
Syrup. aurantii, 1 oz.
Aquæ ad 4 oz.

M. f. mist. A tablespoonful every hour. (*Letzerich.*)

Carbolic acid and iodine mixture for whooping cough.

℞ Acidi carbolici, 15 grains.
Spir. vini rect., 15 minims.
Tinct. iodi, 10 minims.
Tinct. belladonnæ, 30 minims.
Syrupi papaveris, 2½ drams.
Aquæ menthæ pip. ad 2 oz.

M. f. mist. A teaspoonful every two hours, between one and two years of age; half the quantity diluted with water for infants under a year. (*Rothe.*)

Mixture for whooping cough.

℞ Potassii bromidi, 40 grains.
Aquæ laurocerasi, 1½ dram.
Spiritus ætheris, 40 minims.
Succi belladonnæ, 40 mins.
Syrupi codeiæ (B.P.C.), 1 oz.
Syr. flor. aurantii, 1½ oz.
Syrupi et aquæ ad 5 oz.

M. f. mist. One to three teaspoonfuls for a dose, according to age. (*N. Guéneau de Mussy.*)

Decoction of thyme for whooping cough.

Boil an ounce of thyme in a quart of water down to a pint. Sweeten with sugar or honey, and give one to four teaspoonfuls every hour, according to age. If bronchitis exists add 2 drams each of potassium iodide and potassium chloratis to the pint. This relieves the spasmodic cough and shortens the course of the disease. (*Johnson.*)

Mixture for whooping cough.

℞ Extr. cannabis indicæ, 12 grs.
Extr. belladonnæ, 6 grains.
Spir. vini rect., 1½ dram.
Glycerini, 1½ dram.
Aquæ ad 3 oz.

M. f. mist. Half a teaspoonful to two teaspoonfuls for a dose, according to age, night and morning. (Not to be given to children under eight months.) (*Vetlesen.*)

Syrup for whooping cough.

℞ Extracti belladonnæ, 3 grns.
Syrupi papaveris, 1 oz.
Syrupi flor. aurantii, 1 oz.

M. f. syrup. A teaspoonful night and morning. (*Archambault.*)

Cocaine application for whooping cough.

℞ Cocainæ hydrochlor., 20 grns.
Aquæ destill., 400 minims.

M. f. solution. Paint the pharynx, palate, tonsils, root of tongue, and top of larynx three times a day, an hour before food. Give also 2 to 4 oz. of *black coffee* during the day. (*Labric.*)

Irrigation of pharynx with solution of quinine.

℞ Quininæ sulph., 60 grains.
Acid. sulph. diluti, 2 drams.
Aquæ ad 6 oz.

M. f. sol. For the first three days inject a syringeful into the pharynx, the tongue being depressed, every two hours, and for the next four days every three hours. (*Kohlmetz.*)

CHAPTER II.

THE TREATMENT OF THE ERUPTIVE FEVERS—SMALL-POX—SCARLET FEVER—MEASLES—RÖTHELN—VARICELLA.

The Treatment of Small-Pox—Prophylactic Measures during an Outbreak—Quarantine—Isolation—Disinfection—Varioloid—*Indications for Treatment*, mainly Symptomatic, during Period of Incubation—Vaccination—Treatment of the Initial Stage—Of the Eruptive Stage—Of the Suppurative Stage—Of the Stage of Regression—Complications—Convalescence.

The Treatment of Scarlet Fever—Prophylactic Measures—Tenacity of the Infection—Antiseptic Inunction of the Patient—Disinfection of the Throat—Treatment of Mild Cases—Diaphoretics—Aconite—Quinine—Antiseptic Washes for the Throat—Treatment of the Severe, Malignant Forms—Indications—Methods of reducing Hyperpyrexia—Stimulants—Complications—Their Treatment—Otitis Media—Glandular Enlargements—Nephritis.

The Treatment of Measles—Characters of the Disease—Symptoms—Varieties—Complications and Sequelæ—Treatment of Mild Forms—Diaphoretics, etc.—Treatment of more Severe Cases—Of Respiratory Complications—Of Nervous Symptoms—Epistaxis—Rötheln—Varicella.

Additional Formulæ.

The Treatment of Small-Pox.

It will not be necessary, here, to discuss the question of the prophylactic power of vaccination against the attacks of small-pox, or of the necessity of maintaining protective measures against the inroads of this terrible malady. Those who have any doubts on the subject may be reminded that so recently as 1885 no less than 3,164 persons died of small-pox, within nine months, in the city of Montreal. The disease was introduced by a Pullman-car conductor from Chicago, who was admitted into the Hôtel Dieu. The need for isolation was disregarded, and about a month afterwards a servant in the hospital took the disease and died. The authorities of the hospital then sent to their homes all the patients who presented no signs of contagion, with the results we have just stated.*

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* See Osler's "Practice of Medicine," p. 48.

We shall, in dealing with the treatment of this disease, first describe, as briefly as possible, those **prophylactic** measures which are needed when dealing with an actual outbreak of the malady.

On the occurrence of a case of small-pox in a family, all the members of the household should be re-vaccinated, and the patient should be removed to a small-pox hospital. Anyone who has been exposed to the infection should be quarantined for fourteen days, which may be roughly estimated as the *incubation* period of the disease. A suitable place for this purpose must be found, whenever there is an outbreak of the disease.

In places where a small-pox hospital does not exist, **isolation** of the patient must be carried out in his own home, and in the following manner. Only those who have been recently vaccinated, or who have had small-pox, are suitable as nurses. A room on the upper floor is preferable both for ventilation and isolation. It should have an open fireplace, in which a fire should be kept burning. All carpets and hangings and unnecessary articles of furniture should be removed. A sheet wrung out in a strong solution of carbolic acid, or some equally efficacious disinfectant, should be suspended across the doorway. Chlorine gas, sufficiently diluted to be quite respirable, may be diffused through the apartment by putting plates or saucers in the corners of the room, each containing 10 or 20 grains of powdered potassium chlorate, upon which half a dram of strong hydrochloric acid has been poured. The diffusion of this gas can easily be regulated and lessened, when it is too strong, by covering one or more of the saucers with a plate; or, if the odour of chlorine is objected to, pieces of blotting paper soaked in eucalyptus oil may be placed about the room instead; but it is not so efficacious as a disinfectant; or powdered camphor, or spirits of turpentine, may be sprinkled about the apartment.

It is not desirable that the unaffected members of the household should remove elsewhere, lest they should, perchance, become the foci of infection in other districts. They must rely on revaccination, isolation of the affected member or members, and thorough disinfection. The house and the room occupied by the patient should be kept freely, but cautiously, ventilated. An open fire is very useful for this purpose, and also for the immediate destruction by burning of certain infected substances. All the excretions, all the discharges, including those from the mouth and nose, should be received in vessels containing some disinfectant, such as corrosive sublimate, chloride of lime, or carbolic acid, and, when practicable, should be buried deep in the ground, and not thrown into sewers or waste pipes. Handkerchiefs, towels, bedding and clothing, and everything that has come into contact with the patient, should be plunged into water containing chloride of zinc (two fluid ounces to the gallon), or carbolic acid (four fluid ounces to the gallon), and, after remaining there for some time, should be boiled for at least half-an-hour in plain water. Small articles, such as bits of cotton wool, lint, sponges, as well as books, papers, etc., should be burnt as soon as used. All earthenware, glass, or metal vessels used in the room should be cleansed in boiling water before being taken out of the room. No domestic animal, nor any person, except the nurses, should be allowed to enter the room. The attendants should wear over-garments that can easily be cleansed and disinfected, and on leaving the patient they should take a bath with carbolic soap freely used, and wash the hair with a weak solution of corrosive sublimate. Nothing should be worn or carried away from the premises that has been in the infected atmosphere without first being disinfected. The medical attendant should also be careful not to remain longer than is absolutely necessary with the patient, and he should not make unnecessarily detailed examinations. He should pass into another apartment to give his instructions. He should also take care that both his person and his clothing are thoroughly disinfected before visiting other patients. When prolonged examinations are needed an outer garment of mackintosh, fitting close round the neck and wrists, should be worn in the sick-room, and hung up immediately outside it.

The patient, when convalescent, must not be allowed to rejoin his family until all the scabs have disappeared, and until he has had two or three antiseptic baths—sponging the body and hair with a 1 in 2,000 sublimate solution, and afterwards bathing in plain water, using carbolic soap freely. The clothes he wears should be new or free from any trace of infection. In case of death, the body must be washed with a strong chloride of lime or sublimate solution and enveloped in a sheet saturated with one of these, and then placed in a hermetically sealed lead coffin. Disinfection of the sick-room, after recovery or death, is very important. Small things of little value had best be burnt. Whatever will bear prolonged immersion in boiling water, or exposure to steam at, or over, a temperature of 212° F., may be purified by this means; or exposure to a dry heat of 230° F. for two hours will suffice. The apartment itself and the heavy furniture may be disinfected by sulphur dioxide. For this purpose the room should be made as air-tight as possible, and three pounds of sulphur to every 1,000 cubic feet of space burnt in it. The room should be kept closed for twenty-four hours, then opened and thoroughly ventilated. All surfaces should be washed with disinfecting solution (sublimate 1 in 1,000, or carbolic 1 in 50), and afterwards the floor and woodwork scrubbed with soap and water. The ceiling and walls must be whitewashed; or, if papered, the paper should be soaked first with carbolic solution, and then scraped off and burnt; or the walls may be rubbed with slices of new bread. The room had also better be kept open to the air and unoccupied for some weeks. These are the chief measures to be attended to in order to prevent the spread of this disease.

It is only, occasionally, happily, that the practitioner in Great Britain is called upon to treat severe cases of variola. Vaccination has certainly modified greatly the type of this disease, even where it has not conferred immunity, and the form known as "*varioloid*" is that most commonly met with. The mildest cases of this form really require no treatment beyond hygienic measures. The severer forms, however, may approach very closely in characters those of the unmodified disease, and must be, of course, treated in the same manner.

It is somewhat remarkable, that in this, the type of contagious diseases, the infective agent has not yet been identified and isolated, nor have we any medicinal agents by which its activities can be neutralised or destroyed. The **treatment**, therefore (apart from prophylaxis), is symptomatic, and the indications are to maintain the strength of the patient, and to impose such favourable modifications on the course and symptoms of the disease, as may be within the scope and power of the means at our disposal.

With regard to *treatment* during the period of **incubation**, very conflicting opinions have existed as to whether vaccination, performed at any time during this period, can partially or completely protect the patient from the disease, or favourably modify its course. One of the most recent writers on this subject maintains that it certainly can.* He states that he has seen many cases of small-pox, which have been very greatly modified by vaccination, performed during the period of incubation, and some instances in which it has been absolutely prevented. For complete protection he found it necessary that vaccination should be performed "immediately after the reception of the contagium; but, if made at a somewhat later date, a modifying effect may be obtained. No part of the incubation period should be considered too late to make use of this remedy." He thinks that vaccinia only begins to exert prophylactic power when the areola commences to form around the vesicle. "If this stage of the vesicle be reached before the patient shows any symptom of small-pox, the disease may be entirely prevented; if not reached until after the febrile symptoms appear, but before the eruption occurs, it may modify the attack . . . if vaccination be practised on the first or second day after the reception of the infection, the protection may be perfect; and if employed between this date and the fifth day, it may be partial." He also gives reasons for concluding that humanised virus is much more protective than animal lymph, and he prefers "eighth-day lymph taken directly from a typical vaccine vesicle on the arm of an infant." He also insists that a considerable number of insertions should be made in order to lessen the risk of failure, and to hasten the attainment of the prophylactic stage. He objects to bovine lymph because of the relative slowness with which it reaches the areolar stage. Of 159 cases in which he performed vaccination after infection, 29 enjoyed complete protection, 14 were almost completely protected, 20 were protected to a well-marked degree, 24 were partially protected, and 72 were unprotected.

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* Dr. W. H. Welch, Physician to the Hospital for Contagiou and Infectious Diseases, Philadelphia: Hare's "System o Practical Therapeutics," vol. ii. p. 242.

In the **initial** stage, the febrile stage that precedes the appearance of the eruption by about three days, the patient should be kept in bed in a room the temperature of which should be from 65° to 70° F., and some saline diaphoretic should be given, and preferably in effervescent form, such as

℞ Ammonii carbonatis	5 grains.
Potassii bicarbonatis	15 ,,
Liq. ammonii acetatis	2 drams.
Syrupi aurantii	½ ,,
Aquæ	ad 1½ oz.

M. f. haust. To be taken every four hours in effervescence with 15 grains of citric acid.

If there should be sickness, which is not rare with children, fragments of ice with a teaspoonful or two of lime water may be given frequently. A high temperature, with a hot and dry skin, may be treated by sponging with tepid water; and severe headache, by the application to the head of an ice-bag or lint dipped in iced water.

Severe *pain in the back*, together with restlessness, *insomnia*, and other nervous symptoms, may appear in this stage. In children delirium and convulsions may occur. The best remedy for these symptoms is a warm bath, followed by a dose of Dover's powder (1 to 5 grains for a child, according to age, and 12 grains for an adult); or a combination of chloral and sodium bromide may be given for the nervous irritation and sleeplessness, well diluted with water. Should it be difficult to give medicines by the stomach on account of sickness, a morphine suppository may be used; or a small enema of bromide and chloral may be given. Mustard plasters must on no account be used to the back or elsewhere, as they exert a very unfavourable influence on the skin in respect of the eruptions. For the relief of the pain in the back other measures have been suggested. Some order a mixture of chloroform liniment and soap liniment to be rubbed into the back; others recommend dry-cupping, or the application of an indiarubber hot-water bag, and others a few small doses (5 grains) of antipyrin. Cooling acidulated drinks may be freely permitted. The food should be light and fluid, such as milk and light animal broths. A little tea may also be allowed to adults. The bowels must be kept relieved by gentle aperients.

The treatment of the **eruptive** stage must next be considered. This stage usually lasts seven or eight days, but in the modified varioloid it may not last so long. Various *antiseptics* have been used in this stage, both externally and internally, with the hope of modifying the severity of the eruption and preventing pitting, but it cannot be said that any marked success has attended their use. Some benefit has been claimed to follow the use of sulphur, a drug which is, in part, eliminated by the skin, and may therefore exert a local action. The following mixture has been prescribed for children :—

℞ Sulphur. loti.	2½ drams.
Syrupi simp.	1 oz.
Glycerini	1½ oz.
Aquæ flor. aurantii ...	ad 5 oz.

M. f. mist. A teaspoonful every hour.

Moderate doses of quinine, perseveringly given, dissolved in lemon-juice and water, we should strongly advocate. Bianchi has employed antiseptics locally with good results. He uses a boric-acid bath with antiseptic soap every four hours, or a sublimate solution, 1 in 1,000, may be used instead. After the bath an iodoform and vaseline ointment is applied (1 to 5 per cent.). The pustules, where possible, are opened with an aseptic needle, and the patient is wrapped in aseptic linen which is frequently changed. A spray of corrosive sublimate has also been used, combined with ether, according to the following formula :—

℞ Hydrargyri perchloridi Acidi tartarici	āā 15 grains.
Spr. vini rectif.	1½ dram.
Ætheris...	ad 3 oz.

M. This is applied with a hand-spray twice or three times a day. *Great caution must be observed in using so poisonous an application.*

Whitla advises that from the commencement the skin should be kept covered with oil of eucalyptus. The fever usually lessens after the appearance of the eruption, but increases again with the onset of the suppurative period. If the eruption is tardy in its appearance, warm stimulating drinks should be given to promote its full development. The condition of the mouth and throat, which is often very distressing, requires some attention. Mouth-washes of borax and boric acid, or of potassium chlorate, to which a little tincture of myrrh is added, are very comforting, and they may be used warm; or a wash of Listerine and water is very cooling and pleasant. In young children these solutions may be sprayed into the mouth and throat, or the nurse may wash the mouth with her finger covered with lint dipped in them. The burning and itching of the skin may be relieved by the application of ice-cold water; some use a mixture of olive oil and lime water in equal parts, perfumed with lavender water; this should be brushed freely over the skin. Ointments of vaseline, with thymol, or eucalyptol, or carbolic acid, are also serviceable, and are of advantage in lessening the unpleasant odour of the disease. Much pain sometimes attends the development of the eruption in the thick skin of the hands and feet; this is best relieved by hot fomentations.

Towards the latter part of this stage troublesome symptoms of nervous excitement are apt to appear, such as great restlessness, insomnia, and violent delirium. In the robust this condition may sometimes be relieved by a brisk purge and an ice-bag to the head. In some cases a combination of tartar emetic and morphine ($\frac{1}{8}$ to $\frac{1}{2}$ grain of each) has been found of great service in quieting delirium and inducing sleep; or full doses of chloral and bromide, largely diluted, may be given by the stomach, or, if necessary, by the rectum. Certain cases are so violent as to need physical restraint.

The food during this stage must be nutritious and easily digested. Animal broths, milk, bread and milk, whipped eggs, are the most suitable.*

By the stage of **suppuration** is meant the period when the eruption becomes mature and the papules and vesicles have developed into pustules. It usually occupies from the eighth to the twelfth day of the eruption, and it is accompanied with the so-called secondary or suppurative fever. This is the most serious, painful and fatal of all the stages. Often the mouth, throat, and larynx become dangerously involved, swallowing becomes almost impossible, and respiration is greatly impeded. Everything that is possible must now be done to maintain the strength, lessen the fever, relieve the throat symptoms, and disinfect the surface.

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* The form known as *hæmorrhagic* or *malignant* small-pox affords little scope for treatment, as it is almost inevitably and rapidly fatal. Quinine, ergot, perchloride of iron, and even transfusion, have been tried, but not with any curative result.

In **confluent** cases the temperature at this stage may reach 105° or 106° F. Quinine is one of the best agents for allaying the fever as well as supporting the strength. It is one of the most remarkable delusions of modern practice that it is necessary to give enormous doses of quinine in order to produce a decided effect on febrile temperatures. We have again and again, in the hospital wards, shown the strongest evidence to the contrary. The dose necessary is not more than 2 or 3 grains, but it must be given in solution, and best in effervescence with potassium citrate, and it should be given every two, three, or four hours, according to the severity of the fever. We prefer very greatly to reduce temperature by this means, than to have recourse to the depressing antithermic agents, of which we now have so many. Small-pox patients do not bear cold baths or cold affusion well.

The rupture of the pustules by the scratching of the patient, as they itch fearfully, covers the surface with a foul, decomposing, fœtid exudation. Such *antiseptic* washes and sprays as we have already mentioned must now be used freely. Some prefer oily appliances, such as the olive oil and lime water lotion, to which some carbolic acid or eucalyptol may be added (10 to 20 drops to the ounce). Dujardin-Beaumetz strongly recommends an ointment composed of 4 parts of sodium salicylate to 100 parts of cold cream. This is freely applied to the face and other parts affected with the eruption, and these are then dusted over with a powder composed of 6 parts of sodium salicylate and 100 of talc. Welch suggests the trial of a dusting powder composed of 15 to 20 parts of aristol to 100 parts of talc. This authority protests against the use of most of the expedients that have been suggested for the prevention of pitting and scarring, and quotes with approval Gregory's statement that "the masks and ointments formerly in use for that purpose, and so highly vaunted, are, in reality, more hurtful than beneficial. The application of a little cold cream to the hardened scabs is all that can be recommended." We would suggest, as a very suitable application to the face during this and the preceding stages, an ointment composed of camphor 2 parts, menthol 3 parts, and vaseline 20 parts.

At this period of the disease in severe confluent cases the condition of the mouth and throat is such as to cause much anxiety. The mucous membrane of these cavities is often covered with what looks like a diphtheritic membrane, and this may extend into the posterior nares and into the larynx, causing dysphagia and much fœtor of the breath. The disinfecting washes and sprays recommended in the treatment of diphtheria should now be employed. Perhaps the best is a solution of chlorine made by pouring 40 minims of strong hydrochloric acid on 20 grains of powdered potassium chlorate in a 12-ounce bottle, corking the bottle and allowing the liberated chlorine to collect in it, and then filling the bottle, little by little, with water, and shaking at each addition, a very effective disinfecting lotion is thus obtained; a few drams of glycerine should be mixed with it. Or a spray may be used freely to the mouth and nostrils composed of 1 ounce each of glycerine of borax and glycerine of carbolic acid to 12 ounces of rose water.

The patient should be given iced barley water, with a little glycerine in it, to sip frequently. Œdema of the glottis may threaten suffocation and necessitate tracheotomy, which, it is needless to say, would be performed under very unfavourable conditions. The state of the eyes at this period also requires attention; the lids are usually greatly swollen, and pus exudes from between the closed lids. They should be freely bathed and cleansed with warm boric-acid solution.

The patient's strength during this trying and exhausting period must be maintained by the free exhibition of stimulants and nutritious fluid food. The egg-and-brandy mixture of the B.P. should be given freely and frequently. We have already dwelt on the value of quinine in these cases. Digitalis may be needed in threatened heart failure, or caffeine, or hypodermic injections of ether. Dujardin-Beaumetz points out that the symptoms of cardiac failure and the delirium of this stage are often due to an infective *myocarditis*, and he advises frequent injections of ether and the free use of opium, 2 minims of the tincture every hour or two, together with alcohol, caffeine, coffee, and quinine. It is better to keep the bowels unloaded by means of enemata than to give purgatives by the mouth in this stage.

The stage of **regression**, or drying up and disappearance of the eruption and of the swelling and redness of the skin, usually begins about the eleventh to the thirteenth day. The patient will still require supporting food and stimulants and tonics, of which quinine, with perchloride of iron and strychnine, will be the best. Cooling and soothing antiseptic washes, or ointments, are still necessary to disinfect the decomposing débris and exudation which still cover the skin, and to allay the itching.

The numerous **complications** of small-pox have to be treated on the same general principles, as when they occur under other conditions, such as abscesses, erysipelas, gangrene, corneal ulcer, pneumonia, empyema, etc. Corneal ulcer is a very serious complication, and may lead to blindness, and even destruction of the eye-ball; it is not due, as has been supposed, to the formation of a variolous pustule on the cornea, which appears to be immune from the small-pox eruption. Welch has observed it begin with "a little pain and slight redness in a certain part of the eye, usually at the margin of the cornea, and very soon an ulcer is formed. The ulcerative process is often very rapid—so rapid, indeed, as to destroy the entire cornea within forty-eight hours." * In order to prevent this deplorable complication the eyes must be kept scrupulously clean; a saturated solution of boric acid in rose water should be dropped into the eyes twice daily. As soon as any sign of ulceration appears it should be carefully touched with a finely pointed stick of nitrate of silver; atropine should then be dropped into the eye, and cold compresses kept applied. Opium is often useful; it relieves the pain in the eye, and appears to have a good effect in modifying the ulcerative process.

Tonics, such as quinine and iron, and stimulants, of which good beer or porter is the best, and a nutritious dietary, are needed during the convalescent period; the frequent occurrence of boils during this stage may call for the use of arsenic.

Complete shedding of the crusts is hastened by the free application of glycerine to the skin and the daily use of warm baths.

THE TREATMENT OF SCARLET FEVER.

As in the case of small-pox, so with regard to scarlet fever, we shall first refer briefly to the necessary **prophylactic** measures, which must be adopted in order to prevent the extension of the disease, when we find ourselves in the presence of an outbreak. Much that has been said with regard to the prevention of the spread of small-pox, necessarily applies also to the case of scarlet fever. The infective micro-organism of scarlet fever, like that of small-pox, has not yet been discovered or cultivated; it is probably, however, especially abundant in the epidermal scales and dust which are shed from the surface of the body during and after the course of the disease. But we must not, on this account, conclude that scarlet fever is only contagious during the period of desquamation; it would appear to be contagious from the first day of its occurrence up to the time when desquamation has entirely ceased; and some believe that even, after this period, if there should be a discharge from the ear, owing to otitis media, this discharge may prove infectious unless the aural passages are kept disinfected by antiseptic injections.

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* Dr. W. H. Welch, in Hare's "System of Practical Therapeutics," vol. ii. 265.

There is this peculiarity about the poison of scarlet fever, that its tenacity is remarkable, and that it adheres to persons and things with great persistence, and is therefore readily conveyed by such means from place to place; on the other hand, its diffusibility is feeble, especially when compared with that of measles or whooping cough, so that aërial infection is probably very rare. This may account for the frequently observed fact, that in families in which this disease occurs some of the children escape while others are attacked. However, the point which concerns us particularly now is the extraordinary tenacity with which this virus adheres to objects, and the ease, therefore, with which it is conveyed from place to place. Hence it is of the greatest importance that all books, pictures, toys, etc., used by scarlatinous patients should be burnt, and not allowed to pass into the possession or use of other children. Many months may elapse and yet the infection remains active and virulent. It has been said that the method of disinfecting an apartment by burning sulphur in it, as described in the section on small-pox, is useless, because if, immediately afterwards, the *dust* in the apartment is collected, numerous micro-organisms may be obtained from it. But this is rather a foolish criticism; antiseptic *vapours* are intended to act as *aërial* disinfectants, and not necessarily, at the same time, as destroyers of microbes in deposits of dust. Such deposits must be dealt with in a different manner. Aërial disinfection is not supposed to dispense with the necessity of other methods which are needed to disinfect dust-containing objects, or dust deposits.

We have, in a hospital, used chlorine vapour with absolute success in disinfecting a ward of the infection of scarlet fever, but we have never thought of leaving dust deposits, or articles holding dust, to take care of themselves; they must be dealt with differently. All dust deposits should be gathered up and cleared away by sponges wetted in strong antiseptic solutions, and these should be subsequently burnt, or soaked in boiling water, or exposed to a dry heat of 230° to 240° F., and all other contaminated articles must be treated as described in the section on small-pox.

Isolation of the patient, disinfection of his person, and of those about him, and of the air and the necessary objects in the apartment, is the practice that must be carried out in order to prevent the spread of the disease. In the preceding section on small-pox we have described how this may be done. Professor J. Lewis Smith recommends the following antiseptic fluid to be constantly vaporised into the apartment, during the whole course of the case, from the surface of hot water kept simmering over a gas- or oil-stove:—

℞ Acidi carbolici	āā 1 oz.
Olei eucalypti	
Spirit. terebinthinæ	ad 8 oz.

M. Two tablespoonfuls to be added to a quart of hot water.

At the same time the whole surface of the body of the patient should be kept constantly anointed with the following oil:—

℞ Acidi carbolici	1 dram.
Olei eucalypti...	2 „
Olei olivæ	ad 8 oz.

M.

As there is almost invariably some local manifestation of this disease in the throat, where not infrequently patches of false membrane appear, as in diphtheria, disinfection of the throat and mouth is also important. Nothing is more efficacious for this purpose, or more beneficial to the disease itself, than the chlorine mixture we have described at page 636. This should be used freely as a wash for the mouth and throat, and some of it should be swallowed. A borax and boric-acid wash, with a little tincture of myrrh, is also useful for the same purpose, and may be conveniently used in milder cases :—

℞ Acidi borici	1 dram.
Glycerini boracis	1 oz.
Tinct. myrrhæ	2 drams.
Aquæ	ad 12 oz.

M. f. gargar.

Solutions of peroxide of hydrogen (1 part to 3 of water) and weak sublimate solutions are used for the same purpose. For children who cannot gargle, these disinfecting fluids may be sprayed into the mouth, or they may be applied to the throat by means of a piece of absorbent cotton attached to the end of a stick, which can be at once burnt. The physician in attendance should be particularly careful that none of the infective virus attaches itself to his clothes or to his person. The precautions necessary in each case, from this point of view, may best be left to the judgment and discretion of the practitioner himself. Non-attendance on midwifery cases while looking after scarlet-fever patients is a precautionary measure now almost universally adopted. We have already given instructions (page 592) for the disinfection of a room that has been occupied by such a case.

The **indications** for remedial **treatment** in scarlet fever, as in small-pox, are almost wholly symptomatic. The patient should be in a well-ventilated bedroom, but at the same time most carefully protected from cold currents of air and possible chill. He should remain in bed during the active period of the disease—*i.e.* in normal and favourable cases about ten or twelve days—and he should keep his room during the whole time of desquamation, which may last from four to six weeks. In winter or in cold seasons it will be advisable for him to keep the house even longer.

We must distinguish, in considering the appropriate treatment of cases of scarlet fever, between the *mild* forms and the *severe* and malignant forms.

Although scarlet fever is the most fatal of the infectious fevers, yet different epidemics differ very greatly in their severity. In some the cases assume a very mild form, and run generally a favourable course; but even in the mildest cases we can never be sure that some serious complication may not arise. The same careful nursing and medical observation must be given to a mild, as to a severe form of this fever. During the period of invasion, which is brief (the eruption generally appears on the second day), after an aperient dose a diaphoretic saline should be given, and if the child is strong and robust, with a rapid, hard pulse, a small dose of aconite may be added. The following mixture will be suitable :—

℞	Liquoris ammonii acetatis	1½ oz.
	Potassii chloratis	1 dram.
	Tinct. aconiti	24 minims.
	Syrupi limonis	½ oz.
	Aquæ	ad 6 oz.

M. f. mist. One to three teaspoonfuls every four or five hours, according to age.

This mixture will tend to promote the development of the rash, and will at the same time allay the feverishness and heat. The aconite should be omitted after the first forty-eight hours. If there is a thickly-furred tongue and a tendency to vomiting, an effervescing saline with an excess of alkali should be given, and a grain or two of calomel with sugar may be thrown on the tongue; or an aperient dose of Gregory's powder with a grain or two of grey powder may be given. It is well at the outset of all febrile maladies to sweep away any fæcal collections there may be in the intestines.

If the temperature does not rise above 103°, and no very troublesome throat affection manifests itself, little else need be done during the eruptive stage. The child should be clothed in a light flannel night-dress and given fluid food, such as thin broths, gruel, and especially milk or milk and water, freely. When the temperature falls, the patient may be given a mixture of quinine, perchloride of iron, and potassium chlorate as a tonic to protect him, if possible, from any adverse complication and to stave off anæmia. We must remember that potassium chlorate in large doses is a renal irritant, and we should therefore only use small ones. A grain for every year of the child's age, up to 5 grains, is a safe rule. The following mixture may be prescribed :—

℞ Quininæ sulphatis	24 grains.
Potassii chloratis	48 ,,
Tinct. ferri perchloridi	96 minims.
Succi limonis	½ oz.
Syrupi	1 oz.
Aquæ	ad 6 oz.

M. f. mist. One to three teaspoonfuls, according to the age of the child, three or four times a day.

This is also a useful application for the throat, with which it comes in contact in swallowing.

Oily applications to the skin are particularly grateful, and are needed to relieve the dryness and itching which accompany the rash. Vaseline is used by some, or we may use the antiseptic oil already mentioned, or the itching may be allayed by bathing the whole surface with a weak solution of carbolic acid (1 or 2 per cent.) in camphor water, or camphorated oil may be used. Eucalyptus oil as a disinfecting application to the skin has been greatly extolled of late, and the ointment of eucalyptus of the B.P. (or the oil prescribed at page 603) may be used to anoint the surface throughout the whole course of the disease and until desquamation is over.

The discovery of the presence of a streptococcus in the secretions on the fauces in scarlet fever, very like the pyogenes streptococcus, is an indication for the use of antiseptic washes and applications to the throat in all forms and stages of this disease, and we may, by so doing, be enabled to check the tendency to the extension of the local inflammation, from the throat along the Eustachian tube, to the middle ear. Antiseptic sprays and washes, or gargles for those who are able to gargle, should be frequently used, and formulæ for these will be found at the end of the chapter.

In the next place we must consider the treatment appropriate to the severe and malignant forms. The **indications** now are: (1) to support the strength of the patient, (2) to deal efficiently with the local manifestation in the throat, and (3) to prevent, if we can, complications and sequelæ.

The condition which threatens to exhaust the patient, probably more than any other, is the occurrence and maintenance of a high temperature, and when the temperature is very high, and remains so, we must do our best to reduce it. The safest and best way of reducing temperature, although it will not always succeed, is to give quinine frequently, either in solution, in the chlorine mixture we have already referred to, or in effervescence, as in the following prescriptions. In either manner we should give from ½ to 3 grains, according to the age of the patient and the severity of the case, every two or three hours.

℞ Sodii bicarb.	60 grains.
Potassii bicarb.	90 ,,
Potassii chloratis	12 to 36 grains.
Aquæ ... ... ad	12 oz.

M. f. mist. alkalina.

℞ Quininæ sulphatis	24 to 36 grains.
Acidi citrici	1 dram.
Syrupi limonis	1 oz.
Aquæ ... ... ad	12 oz.

M. f. mist. acida. One or two tablespoonfuls of each mixture every two or three hours. The larger dose is for adults. Very young children may take doses of a dessert-spoonful.

Quinine given in either of these ways * will be found, in most cases, to exert a remarkable effect in moderating the high temperature, while we run no risk of producing any depressing effect on the patient, or of determining renal irritation or congestion.

There are, however, other means of reducing temperature in these cases to which it is necessary we should allude. The use of general cold baths, or the cold pack, is now generally avoided by physicians of experience. Scarlet-fever patients, for the most part, bear the general application of cold badly. But in hyperpyretic cases the *local* application of cold to the *head* and *neck* is often very efficacious in lowering the temperature, while it does not depress the patient. The application of an ice-bag to the head, or of pieces of lint or linen soaked in ice-cold water with which a little vinegar and eau-de-cologne have been mixed, is most refreshing; and at the same time a broad strip of lint, or soft linen, soaked in the same iced water should be wrapped round the neck and throat and frequently renewed. The temperature may often be reduced by this means if it is perseveringly applied. In a vigorous patient the limbs may also, from time to time, be lightly and rapidly sponged with this cold lotion. The more frequently this is done, the greater will be the effect on the temperature. In cases with feebleness of circulation and general depression, cold must not be applied to the extremities, but rather tepid or even *hot* water, combined with stroking or friction in the direction of the venous blood-current. Sucking fragments of ice has also a cooling effect, and still more cooling is an ice-cold enema which may be composed of a few ounces of peptonised milk.

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* The antipyretic effect of quinine is much greater, when given in this combination, than when given alone in the solid form.

We cannot recommend the employment of the various antipyretic drugs that have recently been so widely used in the treatment of febrile maladies; there is too great risk of undue depression attending their use. Certainly sodium salicylate, antifebrin, thallin, kairin, and antipyrin should be avoided. We have, however, seen good results follow the frequent exhibition of small doses of *phenacetin* in combination with quinine. The dose of phenacetin should not be more than $\frac{1}{4}$ to 1 grain for children between two and ten years of age. This dose may be given every hour or two. Aconite, as we have already stated, we reserve entirely for the early stage of the disease.

In case of the occurrence of delirium and muscular twitchings or convulsions, a few doses of sodium bromide should be given, in quick succession, until these manifestations of irritation of the nervous centres are quieted.

Alcoholic and other stimulants will be needed in this as in other acute diseases, when symptoms of exhaustion and threatened cardiac failure make their appearance. An ether and ammonia mixture containing from 5 to 20 minims each of spirits of ether and of aromatic spirits of ammonia in strong camphor water may be given every hour; and camphor has been injected hypodermically, on the recommendation of Henoch, dissolved in rectified spirits (1 in 5). Of alcoholic stimulants, whisky, brandy, or champagne are the best. A tablespoonful of iced champagne, with one of water, every hour will be most grateful when there is much thirst and a dry, parched mouth; but in cases bordering on collapse, brandy or whisky in one- or two-teaspoonful doses, given in hot milk, is better.

The period of convalescence, in uncomplicated cases, will require careful watching and protection from chill. Light, nourishing food, and tonics, of which quinine and iron are the best, will also be needed.

The treatment necessitated by the occurrence of certain **complications** and **sequelæ** must be very briefly noticed.

There can be little doubt that the glandular, visceral, and other complications of this disease are caused by absorption of the infective virus from the throat and pharynx and adjacent parts, and that the early and thorough application of local antiseptic measures offers the most trustworthy means for protecting the constitution from the consequences of this secondary infection. It is desirable, therefore, from the first appearance of symptoms of this disease, to frequently irrigate or spray the throat and nasal passages with suitable antiseptic fluids, and this may easily be done with one of the "hand-atomisers" now so largely used. One of the best fluids for this purpose is that to which we have formerly called attention—viz. a mixture of 1 dram of glycerine of carbolic acid and 10 grains of sodium bicarbonate to an ounce of warm water. Some prefer a mixture of 1 part of peroxide of hydrogen to 3 or 4 of water. Other formulæ will be found at the end of the chapter. Professor Lewis Smith recommends the following as particularly suitable for nasal irrigation :—

℞ Acidi borici	1 dram.
Boracis	2 drams.
Aquæ puræ	1 pint.

M. To be used warm.

"The best instrument for this purpose is a small syringe of glass with a curved neck and a bulbous tip. The child's head should be thrown back, and the piston depressed rapidly so as thoroughly to wash out the nasal cavity." *

The evils resulting from the occurrence of **otitis media,** as a complication or sequel of scarlet fever, may sometimes be prevented by careful treatment at the onset of the symptoms. As soon as pain in the ear is complained of, a few drops of a mixture of equal parts of laudanum, a 5 per cent. solution of cocaine, and glycerine may be dropped into the ear, and a hot bran poultice at the same time applied. But the most effectual means of relieving the pain, which we have found succeed when other measures have failed, is to heat a large wine-glass by pouring hot water into it, and then to pour 10 to 20 minims of chloroform upon a small piece of cotton wool in the bottom of the glass and hold the glass, closely applied, over the affected ear. The vapour of the chloroform enters the ear and acts both as an antiseptic and anæsthetic. Subsequently the chloroform may be mixed with tincture of iodine, and mixed chloroform and iodine vapours are thus conveyed into the ear, while iodine paint should at the same time be applied behind and in front of the ear. Some think highly of the early application of a leech to the posterior surface of the tragus. But we prefer the method we have just described to every other. Puncture of the tympanum has been warmly advocated if the pain and inflammation continue, and if, on examination of the ear by the speculum, the tympanum is found to be tense and bulging. This operation may save the membrane from ulceration and the patient from chronic suppurative otitis. After the puncture the antiseptic vapours of chloroform and iodine should be allowed to pass into the ear every few hours, as detailed above, and the throat should be kept diligently cleansed by antiseptic washes. It may be necessary in some cases, by means of Politzer's bag, to clear out pent-up secretion from the tympanic cavity. Should, however, ulceration of the tympanum have occurred and a putrid otorrhœa have been established, the ear must be gently syringed with a warm antiseptic lotion two or three times a day (a saturated solution of boric acid in water is as good as any), and afterwards a little fine powder of boric acid insufflated; or the iodine vapour and paint should be applied as already indicated. The external meatus may be lightly filled with iodised or menthol cotton wool, or cotton wool that has been dipped in a solution of zinc sulphate and rose water (5 grains to the ounce).

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* Hare's "System of Practical Therapeutics," vol. ii. p. 202.

The **glandular** enlargements in the neck, which often follow scarlet fever, may frequently be dispersed quickly by steady and continued inunction of iodide of lead ointment. At the same time we should give cod-liver oil and syrup of the iodide of iron internally.

Albuminuria from nephritis (we do not refer to merely febrile albuminuria) occurs with very varying frequency in different epidemics of this disease. It is one of the most serious of the sequelæ of scarlet fever. Some of the cases of scarlatinal nephritis are no doubt induced by incautious exposure to chill during convalescence, and this will account for the number of those cases that occur after quite mild attacks of the disease. But in other cases it would seem more consistent with observed facts to refer the nephritis to the irritation of the kidneys by the specific virus of the disease.

The measures that should be taken to prevent the absorption of the infective agent, from the throat and adjacent mucous surfaces, have been fully dwelt upon, and here we must call attention chiefly to the importance of protecting the patient, during the period of convalescence and desquamation, from the possibility of chill. The child should be kept in a warm apartment during the three or four weeks that peeling is going on, and the urine should be frequently examined in order to detect the earliest sign of approaching nephritis. Should nephritis supervene, it must be dealt with according to the principles we have already laid down in treating of that disease.

THE TREATMENT OF MEASLES.

Measles, like scarlet fever, is a highly contagious disease, and probably depends on the invasion of the body by a specific microbe; but this has not yet been discovered and cultivated. The contagion of measles, although not nearly so tenacious as that of scarlet fever, is far more diffusible; so that when it appears in a family its spread is more general. The contagion appears to be in the breath, in the secretions from the disordered mucous membranes, and in the eruption on the skin, especially during desquamation. The contagion is said to be rapidly dissipated by ventilation, but we have known it remain in a room in a college, and affect two sets of adult residents, after an interval of six months. This disease attacks adults exposed to the infection, as well as children, and of all the specific eruptive fevers it is the one most prone to recurrence, and the least protective against subsequent attacks. It is very prone to follow whooping cough, or to be followed by it. No disturbance of health is noticeable during the incubation period, which varies within very narrow limits—viz. from ten to thirteen days.

Little **treatment**, beyond warmth and protection from unfavourable influences, is needed in ordinary cases of measles; but the tendency to complications and to sequelæ of a serious nature, especially affecting the respiratory organs, renders it necessary to observe great care and caution in the management of cases of this disease.

The disease commences with a somewhat sudden rise of temperature, which may reach nearly 104° on the first day. It then falls again a degree or two, until the appearance of the eruption on the fourth day, when it again rises. Characteristic **catarrhal** symptoms appear at the onset. There is often intense **coryza**, profuse running from the nose and eyes, the conjunctival and nasal mucous membrane being injected and swollen, and the eyes and face puffed. Laryngeal and bronchial catarrh may also be present, as indicated by a harsh, dry, distressing cough, and rhonchal and sibilant râles over the lungs. There may, at the same time, be some redness and soreness of the throat. The eruption is usually of short duration, and desquamation, in the form of a fine, branny powder, begins on the sixth or seventh day of the fever, and lasts for a week or ten days. The patient during convalescence continues highly infective.

In well-protected and well-nursed children, measles usually runs a mild and favourable course; but occasionally cases occur of great gravity, to which the term **malignant** measles is applied. The so-called **hæmorrhagic** form is now rarely seen. In this variety the rash is purpuric in character, and hæmorrhage occurs from all the mucous membranes; this form is rapidly fatal. A "typhoid" form has also been described; in this the fever is high and continued, the eruption is ill-developed, and of livid aspect, the pulse is quick and feeble, the tongue dry and brown, and drowsiness and delirium usually foretell a fatal end.

The most frequent as well as the most serious **complication**, and the one which is responsible for the deaths of most of the victims of this disease, is **broncho-pneumonia.** This is often attended in young children with extensive pulmonary collapse. Other complications which occasionally appear are severe intestinal catarrh (diarrhœa), diphtheritic laryngitis, epistaxis, ophthalmia, aural catarrh and deafness, and sometimes suppurative otitis. Of the more serious **sequelæ** we may mention gangrene of the mouth (cancrum oris) or vulva, necrosis of the lower jaw, cervical glandular abscesses, and tuberculosis of bronchial glands. So that measles appears as a very serious malady when regarded from the point of view of its complications and sequelæ.

With regard to the **treatment** of measles; * as we have already said, the mild and favourable forms occurring in children of good constitution and sound health require little besides confinement to bed in a *warm* room of a temperature of 70° F., and protected from all possibility of chill from currents of cold air (we are most strongly of opinion that the modern craze for ventilation is frequently carried to an injurious extent in the management of this disease). The room may advantageously be darkened if the coryza is severe. We should give the patient light and chiefly fluid food. Warm drinks, and warmth to the surface, certainly favour the complete and early development of the rash; and we believe, by promoting the early and full development of the eruption on the skin, we help to protect the child from respiratory complications. Although, in many cases, not absolutely necessary, we think it always desirable to order a diaphoretic mixture. In the first place, it promotes the early and complete development of the rash, and it impresses the patient's family with the need of careful nursing and protection from unfavourable influences. It is an error to treat lightly any case of measles, however mild the attack may at its onset appear. The following is a simple and useful medicine for the purpose we have named :—

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* The measures necessary for isolation and prophylaxis we have already fully dwelt upon in the two preceding sections. They need not be quite so rigorously enforced in cases of measles. "The specific germ, unlike that of scarlet fever and diphtheria, does not adhere to objects handled by the patient or in his immediate vicinity; nor does it adhere to the clothes, bedding, furniture, or walls of the apartment occupied by the patient" (Professor J. Lewis Smith).

℞ Potassii nitratis	1 dram.
Liquor ammonii acetatis	2 oz.
Vini ipecacuanhæ	36 minims.
Syrupi limonis	6 drams.
Aquæ	ad 6 oz.

M. f. mist. A teaspoonful to a tablespoonful, according to age, every four or five hours.

The bowels should be regulated, and a gentle aperient, such as a dose of citrate of magnesia, given if necessary. The child may be allowed to drink freely of barley-water or lemonade. During desquamation the child should be daily anointed with a mixture of 1 in 20 of eucalyptus oil and olive oil, and well sponged with hot water and carbolic soap.

In the milder forms nothing more will be needed. As the eruption fades, a quinine tonic may be given twice a day, and a gradual return to the ordinary diet may be permitted. The convalescence must, however, be carefully watched, and every possible risk of cold-catching guarded against. In winter, or in inclement seasons, confinement to the house, for a month after the eruption has disappeared, is desirable.

But in more severe cases other measures may be necessary. Cough may be troublesome simply from pharyngeal or laryngeal catarrh, and some sedative and expectorant may be required to relieve it. The following syrup will be found of use. When the cough is very dry and hard, a tablespoonful of hot water should be added to each dose :—

℞ Sodii bicarbonatis	32 grains.
Ammonii chloridi	16 ,,
Vini ipecacuanhæ	24 minims.
Spr. chloroformi	48 ,,
Syrupi tolutani	6 drams.
Aquæ	ad 2 oz.

M. f. mist. One or two teaspoonfuls occasionally for the cough.

Should the cough be troublesome at night and prevent the child from sleeping, a grain or two of Dover's powder may be mixed with a dose of the above and given at bed-time.

If bronchial catarrh is developed, the chest should be wrapped in a cotton-wool jacket and some counter-irritant applied. One of the best is equal parts of turpentine liniment (B.P.) and olive oil, rubbed in freely and frequently over the front and back of the chest by the warm hand of the nurse covered with a flannel glove. The air of the room should be kept moist by the diffusion of the steam of hot water. The inhalation of a warm spray consisting of 1 dram of glycerine of carbolic acid and 10 grains of sodium bicarbonate to an ounce of hot water is very useful in the treatment of these infective ailments.

If signs of broncho-pneumonia appear, hot linseed and mustard poultices may from time to time be applied over the bases of the lungs, in addition to the use of the above liniment. Hot milk mixed with Apollinaris water, an ounce or two at a time, with half a teaspoonful to a teaspoonful of brandy, should be given every hour or two. An ammonia and senega mixture should also be prescribed :—

℞ Ammonii carbonatis	32 grains.
Ammonii chloridi	24 ,,
Tinct. senegæ	80 minims.
Aquæ chloroformi	ad 4 oz.

M. f. mist. One to four teaspoonfuls every two or three hours, in a little milk and water.

Dry-cupping has been recommended to relieve attacks of severe dyspnœa. If the temperature keeps high, with a burning, dry skin, sponging the body with tepid water may be useful, and grain doses of quinine every three or four hours, dissolved in lemon juice and water, will be the best antipyretic.

Constipation is best relieved by small enemata of warm water containing a teaspoonful or two of glycerine; or of warm soap and water with a little olive oil or castor oil.

The occurrence of convulsions, or of restlessness and delirium, must be met by the administration of sodium bromide, or, if this fail, by chloral enemata. Should the convulsions be associated with a recession, or an imperfect development, of the eruption, the child should be put into a hot bath, the head being at the same time bathed with iced water.

Epistaxis, when continued and profuse, may require the insufflation of astringents such as powdered alum or tannin; or even plugging the nares may be necessary. The sequelæ of measles, such as cancrum oris, etc., must be treated on the same general principles as apply to them when they occur in other circumstances.

RÖTHELN.

In this contagious eruptive fever, which usually runs a very mild course, the same kind of treatment is appropriate as that described for a mild form of measles. A mild quinine or quinine and iron tonic is often needed during convalescence.

VARICELLA.

This mild vesicular eruption is rarely attended with any notable disturbance of the general health, and requires no general treatment. The patient should be cautioned not to scratch and rupture the vesicles, as in that case they sometimes leave a permanent mark. The itching may generally be relieved by a weak carbolic lotion made with camphor water.

ADDITIONAL FORMULÆ.

SMALL-POX.

Febrifuge mixture in initial stage of small-pox.

℞ Spirit. ætheris nitrosi, ½ oz.
Syrupi limonis, ½ oz.
Liq. ammon. acet. ad 6 oz.

M. f. mist. Two or three teaspoonfuls every two hours in a little ice-water. (*Welch.*)

Carbolic acid mixture in small-pox.

℞ Acidi carbolici, 15 minims.
Tinct. cinchonæ, 2 drams.
Syrupi aurantii, 4 drams.
Mucilaginis acaciæ, 1 oz.
Aquæ ad 5 oz.

M. f. mist. A tablespoonful every two hours. (*Audhoui.*)

SMALL-POX (*continued*).

In hæmorrhagic small-pox.

℞ Extracti ergoti liq., 3 drams.
Olei terebinthinæ, 3 drams.
Spirit. ætheris nitrosi, 2 drs.
Spirit. rectificatus, 1 oz.
Ovi vitellum, 1 oz.
Aquæ menthæ pip. ad 8 oz.

M. f. mist. An eighth part every third, fourth, or sixth hour, as required.
(*J. W. Moore.*)

Local application for the eruption.

℞ Linimenti calcis ad 8 oz.
Olei eucalypti, ½ oz.
Calaminæ præparati, 1 dram.

M. f. applicatio. To be applied with a large camel-hair brush to the skin of the face every two or three hours.
(*Whitla.*)

Ointment for the eruption.

℞ Acidi salicylici, 1 dram.
Pulv. amyli, 10 drams.
Glycerini, 4 oz.

M. f. ung. To be applied on lint to the face. (*Lewentauer.*)

Ointment and powder (disinfecting) for small-pox.

℞ Sodii salicyl., 1 dram.
Vaselini, 3 oz.

M. f. ung. Apply to the parts affected and afterwards dust them with a powder composed of 2 drams of sodium salicylate and 3 oz. of talc.
(*Baudon.*)

Iodine application for the pustular stage of small-pox.

℞ Tinct. iodi, ½ oz.
Glycerini ad 2 oz.

M. f. app. To be applied to the skin with a brush every four hours. (*Pioch.*)

SCARLET FEVER.

Chlorine mixture for scarlet fever.

℞ Pulv. potassii chloratis, 8 grains.

(Pour on this in a pint bottle):

Acid. hydrochlorici fort., 1 dram.

(Cork the bottle and shake occasionally.)

Aquæ ad 1 pint.

After a time, add the water little by little, shaking at each addition (in cold weather the bottle should be first warmed).

A tablespoonful, or two, of this mixture, according to age, may be given frequently. An adult may take the whole pint in a day. (*Watson.*)

"Diaphoretic, diuretic, and laxative" mixture for scarlatinal nephritis.

℞ Potassii acetatis, 2 drams.
Potassii bicarbonatis, 2 drs.
Potassii citratis, 2 drams.
Infus. tritici repenti ad 8 oz.

A teaspoonful every three or four hours for a child of five years. (*J. Lewis Smith.*)

Quinine mixture in mild cases of scarlet fever.

℞ Quininæ sulphatis, 16 grains.
Syrupi pruni virginiani, 1 oz.
Syrupi yerbæ santæ, 1 oz.

M. f. syrup. One teaspoonful every three or four hours for a child from three to five years old.
(*Prof. J. Lewis Smith.*)

SCARLET FEVER (*continued*).

Diaphoretic mixture in early stage of scarlet fever.

℞ Spirit. ætheris nitrosi, 2 drs.
Potassii citratis, 1 dram.
Liq. ammon. acet., 1½ oz.
Syrupi simplicis, 1 oz.
Aquæ camphoræ ad 4 oz.

M. f. mist. A teaspoonful every three hours. (*Whitla.*)

Mixture for scarlatinal nephritis.

℞ Potassii acetatis, 20 to 60 grains.
Syrupi simp., 3 drams.
Infusi digitalis ad 3 oz.

M. f. mist. A teaspoonful every two hours. (*Widerhofer.*)

Cathartic powder in scarlatinal nephritis.

℞ Olei cinnamoni, 8 drops.
Magnesii sulphatis, 1 oz.
Potassii tartarati acid., 2 oz.

M. A teaspoonful, repeated at intervals of from two to four hours until catharsis occurs. (*J. Lewis Smith.*)

Tonic powders during convalescence from scarlet fever.

℞ Ferri carb. sacchar., 8 grains
Quininæ sulph., 8 grains.
Sacchari albi, 40 grains.

M. et divide in pulv. 10. One night and morning. (*Widerhofer.*)

For scarlet fever with diphtheritic throat affection.

℞ Potassii chloratis, 20 grains.
Syrupi aurantii, 3 drams.
Decoct. cinchonæ ad 3 oz.

M. f. mist. A teaspoonful every two hours.

℞ Potassii chloratis, 1 dram.
Aquæ, 12 oz.

M. f. gargar.

(The diphtheritic spots to be also touched with pure lactic acid.) (*Widerhofer.*)

Spray for the throat in scarlet fever.

℞ Glycerini boracis, 4 drams.
Glycerini acid. carbolici, 3 drams.
Aquæ rosæ ad 10 oz.

M. (*Whitla.*)

Antiseptic application for the fauces when foul and offensive in scarlet fever.

℞ Acidi carbolici, 10 minims.
Liq. ferri subsulphatis, 3 drams.
Glycerini, 1 oz.
Aquæ, 1 oz.

M. f. applic. To be applied with a large camel-hair pencil every three to six hours. (*J. Lewis Smith.*)

Lotion for the itching of the skin in scarlet fever.

℞ Acidi carbolici, 1 dram.
Tinct. camphoræ, 2 oz.
Aquæ puræ, 1 pint.

M. f. lotio. Shake well and apply over surface when needed for pruritus. (*Prof. J. Lewis Smith.*)

Chloral enemata for eclamptic convulsions in scarlet fever.

℞ Chloral hydrate, 30 grains.
Dec. althææ, 6 oz.

M. A fourth part to be injected into the rectum the moment the convulsions commence. (*Widerhofer.*)

Ether and camphor injection (hypodermic) in case of collapse.

℞ Camphoræ, 30 grains.
Ætheris, 5 drams.

M. Twenty minims to be injected under the skin. (*Widerhofer.*)

CHAPTER III.

THE TREATMENT OF TYPHOID OR ENTERIC FEVER, AND OF TYPHUS FEVER.

THE TREATMENT OF TYPHOID FEVER—Nature and Origin of the Disease—The Typhoid Bacillus—Diffusion—Characteristic Lesions—Symptoms and Course—Prophylaxis and Disinfection—Indications for Treatment—General and Special—The Personal Care of the Patient—Diet—Stimulants—Antiseptic Treatment—Intestinal Antisepsis—Various Antiseptic Agents used—Quinine and Chlorine—Good Results of this Method—Calomel—Sulphurous Acid—Iodine—Iodoform—Naphthol—Salicylate of Bismuth—Thymol—Carbolic Acid—Sulpho-Carbolate of Zinc—Turpentine—Boric Acid—Salol—Oil of Eucalyptus, etc.—Treatment of Complications—Hyperpyrexia—Cold Water Applications and Baths—Diarrhœa—Hæmorrhage—Perforation—Cardiac Asthenia and Pulmonary Congestion—Nervous Symptoms—Convalescence.
THE TREATMENT OF TYPHUS FEVER.
Additional Formulæ.

TYPHOID FEVER.

WE cannot here enter into a detailed examination of the history, pathology, and clinical course of **typhoid fever**; we shall only therefore call attention to those facts in connection with its origin, dissemination, symptoms, and course which are essential to a comprehension of its true character, and which may enable us to establish rational indications for its treatment. Moreover, the history, pathology, and morbid anatomy of this disease have been so well studied and so frequently described, and its clinical course and results are so well known, that we should be only going over ground familiar to most of our readers in dwelling at any length on these details.

With regard to the mode of origin and nature of this disease, it is now generally accepted that it is an infective bacillary disease, caused by the introduction into the human body of a specific pathogenic organism—the so-called **bacillus** of Eberth. This is a short, thick, mobile bacillus, having rounded ends, at one or both of which there is seen a glistening, round body, thought by some to be a spore. It can be cultivated in nutrient media, and grows on potato in a characteristic manner. It resembles in many respects the *bacterium coli commune*, and in form is scarcely distinguishable from it, but its clinical reactions are different. This resemblance has led to the suggestion that Eberth's bacillus is only a modification of the *bacterium coli commune;* and to the inferences (1) that fæcal matter proceeding from the healthy intestine may, in certain circumstances, give rise to the poison of enteric fever; and (2) that the *bacterium coli* acquires its virulent characters outside the human body.*

The bacillus of Eberth, however, fulfils two of the three conditions necessary to establish its causal relation with typhoid; it is constantly present in the characteristic lesions, and it grows outside the body in a specific manner. The third condition—viz. the experimental production of the disease by the introduction of pure cultures into the bodies of healthy animals—has not yet been fully realised, owing to the difficulty, or probably the impossibility, of producing typhoid in the animals hitherto experimented upon. Brieger has described a ptomaine—typhotoxin—and a toxalbumin as amongst the products of the typhoid bacillus. Its cultures are killed by a temperature of 60° C., and those on bouillon by solutions of carbolic acid 1 in 200, and of sublimate 1 in 2,500. This organism will resist drying for days, and in water outside the body it will retain its vitality for weeks. In milk this bacillus undergoes rapid development; whether it does so also in water is not known for certain. In the soil it appears to increase, and to retain its vitality for months, and it will also live in ice for months. In certain epidemics it has been actually detected in the infected water supply. In recent cases of typhoid these bacilli have been found in the lymphoid tissues of the intestine, in the mesenteric glands, and in the spleen and liver. It has also been asserted that they have been found in the blood and in the urine.

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* Rodet and Roux—"Comptes-Rendus Hebdomadaires des Séances de la Société de Biologie," Feb. 21, 1890; and Prof. F. P. Henry, "Hare's System of Practical Therapeutics," vol. ii. p. 270.

This organism is clearly, then, the **infecting agent**; and prophylaxis requires us to ask, How does it become disseminated, so as to communicate the disease from the infected to the non-infected? Although it is, certainly, only given off in the stools of typhoid patients, and not by their breath or skin, yet it is sometimes *directly* communicated from sick persons to the attendants, or others brought into contact with them. This probably arises through want of sufficient precaution in handling the patients, or the linen soiled by their evacuations. Dujardin-Beaumetz expresses his belief that it arises, especially in the case of nurses and medical students, through contamination of the hands, which are not washed with sufficient care or sufficiently soon after contact with typhoid patients. But it also appears certain that, if great care and cleanliness are not observed with regard to the bed and body-linen of the patient, the infection may be diffused through the air immediately around the patient from the dried excretions.

The *direct* conveyance of infection must therefore be due to some defect in details of cleanliness and caution. The most common mode of *indirect* communication is undoubtedly through the contamination of *water* by typhoid dejecta. The origin and spread of many epidemics have been clearly shown to be so produced. *Milk* is a common vehicle of dissemination (usually from the use of contaminated water for washing the milk cans), and in this fluid the germs rapidly multiply. The *gases* escaping from infected sewers are not themselves infective, but in their escape, especially under pressure, they mechanically convey the solid germs where they may become the source of mischief. Having entered the human body and reached the intestinal canal, these germs appear to pass through the epithelial lining to the subjacent lymphoid tissue, where they excite a specific irritation which leads to active cell proliferation. If this hyperplasia of the lymph-follicles reaches a certain degree from excessive action of the poison, necrosis occurs with the formation of an ulcer. It is probable that in the development of the bacilli certain toxalbumins are produced, and these passing into the blood give rise to the constitutional febrile disturbances. At the same time the mesenteric glands, the spleen, and the liver become affected by the action of the bacilli, and become enlarged—particularly the spleen and the mesenteric glands. An intestinal catarrh with diarrhœa (pea-soup-like evacuations) accompanies the intestinal ulceration.

This **intestinal ulceration** is the characteristic and the most important lesion in typhoid fever. There may be only a few small superficial ulcers, or the ulceration may be extensive, and involve large tracts of mucous membrane. They are most common at the lower part of the ileum. The solitary glands of the cæcum and colon are also frequently affected, and may go on to ulceration. This intestinal ulceration is the cause of two of the most serious incidents of the disease—*i.e.* peritonitis from perforation of the floor of the ulcer, and hæmorrhage during separation of the sloughs. The spleen is always more or less enlarged, sometimes considerably so, and the liver generally, but not always. Morbid changes, in many other organs, may arise in the course of the severer forms of the disease, but the preceding are those that are chiefly characteristic.

The main **symptoms** of the fever are briefly these:—During the incubation period, which lasts on the average about a week or ten days, there is complaint of lassitude and weariness; then the disease sets in with chills, headache, loss of appetite, nausea, pain in the limbs and back, and occasionally epistaxis; the temperature usually rises steadily, day by day, during the first week, until it reaches 103° to 104°, or higher; there is a quick pulse, 100 to 120, of low tension, and often markedly dicrotic; the tongue is coated with a yellowish-white fur, and the tip and edges are characteristically clean and red; there may be slight rambling at night; slight diarrhœa may already appear; but, on the contrary, the bowels are often constipated at this stage; some enlargement of the spleen may be detected about the end of the first week (though not always to be made out); and at this period the characteristic *rose-spots* begin to appear, usually on the abdomen and lower part of the chest; some cough from bronchial catarrh is not uncommon. During the second week the temperature remains high, and the morning remissions are slight, there is dulness of intellect, and the tongue becomes dry; if the case is severe and abdominal symptoms become pronounced, there are diarrhœa, tympanites, and tenderness, especially over the right iliac region. In the third week the temperature usually shows marked remissions in the morning, and the fever begins to decline, debility and emaciation are notable, and the diarrhœa and abdominal distension may continue. This is often the critical period in the illness, when unfavourable symptoms may appear, such as delirium, a dry, brown tongue, cardiac debility and pulmonary congestion, intestinal hæmorrhage or perforation.

Convalescence in favourable cases usually begins in the fourth week (in slight cases earlier), the temperature falls to normal, the diarrhœa ceases, the tongue cleans, and the appetite is often ravenous; but in bad cases, those serious symptoms we have previously mentioned may become intensified, and the patient may lie in a state of profound prostration. In some cases the fever is protracted into the fifth and sixth weeks; and it is during this period that **relapses** are prone to occur.

Great variations in the course and severity of cases of typhoid are observed in different epidemics, and we should be especially on our guard with respect to what has been termed the "*ambulatory form*," in which the initial symptoms have been so slight and indefinite that the patient keeps on with his usual occupation, and may only come under our notice in the middle or towards the end of the attack. Then very serious symptoms may set in, and a rapidly fatal issue is not uncommon; in other cases the febrile symptoms are, all through the attack, so slight that it is with difficulty the patient can be made to realise that his illness is of a serious nature.

This brief sketch of the chief characters of typhoid fever will be supplemented, and filled in, by the details which will naturally arise for consideration in discussing questions of *treatment.*

We will, in the first place, dispose of the question of **prophylaxis,** and we are now only concerned with domestic and individual prophylaxis. It should be borne in mind that typhoid is conveyed in 99 per cent. of cases by polluted drinking-water; and whereas we should, at all times, be on our guard against drinking any water of the purity of which we are not absolutely sure; during the prevalence of this disease, or when travelling from place to place, we should be more especially careful to drink no water that has not been **boiled.** A filter is a convenient vessel in a house for the storage of drinking-water, but the water supplied to the filter should be boiled—a duty which should only be confided to a thoroughly trustworthy person. In travelling either a table-water of known purity should be drunk, or some simple means for boiling water should be carried.

Milk is also a common medium for the conveyance of the typhoid germs, either owing to its dilution with impure water, or from the use of impure water for washing the milk cans; but milk being very absorbent, it may become contaminated by exposure to impure air, and we have already mentioned the fact that the bacillus of typhoid multiplies rapidly in milk. It is therefore a good rule in families, that all milk should be boiled on being delivered, and subsequently stored in a closely-covered vessel.

The certainty that the germs of typhoid may be conveyed by the gases escaping under pressure from infected drains and sewers has led to the universal recognition of the necessity of thoroughly ventilating all soil-pipes, drains, and water-closets. Whether the germs pass into the lungs, or, as some maintain, adhere to the mucous membranes of the mouth and throat, and so pass into the intestine, is uncertain.*

The principle of prophylaxis, in dealing with an actual case of typhoid, is to destroy the vitality of the germs discharged from the intestine as soon as possible, and so prevent the infective organism being conveyed into the soil-pipes and drains, or otherwise disseminated.

In the case of a typhoid fever patient who is nursed at home, and not removed to a hospital, the following rules should be observed as closely as practicable. The patient should be isolated as completely as possible from the rest of the household, and only those in attendance upon him should be admitted into his room. Great cleanliness should be observed by the attendants, who should keep their hands frequently washed in carbolic lotion (1 per cent.), and should wear cotton or easily-washable dresses, which should be frequently changed, and discarded and cleansed immediately, if accidentally soiled by discharges from the patient. The bedroom should be preferably without carpets, curtains, or hangings of any kind, and should be kept well ventilated. The bed or beds (for it is best to have two side by side, so as to be able to move the patient easily from one to the other for cleansing purposes, etc.) should be in the middle of the room, not in a corner. The motions should be received in a bed-pan and disinfected as soon as passed. There are various ways of doing this. For an emergency, and in the absence of other disinfectants, *boiling* water may be used in the proportion of four or five times the bulk of the discharge; but this should not be trusted to when other disinfectants can be obtained. The best disinfectants for this purpose are—a 5 per cent. solution of chloride of zinc; fresh chloride of lime used freely; or "milk of lime," (as it is termed by the Germans)—*i.e.* slaked lime mixed with water so as to make a thick "white-wash," and added very freely to the dejections (this is very cheap, easily procured, and very effectual). Corrosive sublimate with excess of hydrochloric acid, when used of sufficient strength, is also very effectual, but it has two disadvantages—of being highly poisonous and of corroding metal drain pipes. Burying the fæces without disinfection must not be thought of, as the typhoid bacillus multiplies even nine feet below the surface. Whatever disinfectant is chosen it should be used very freely, and thoroughly mixed with and kept in contact for a time with the evacuations before they are thrown away; a little should always be put into the bed-pan before it is used.

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* In a case we saw of infection, through the passage of sewer gases into a servant's bedroom from a ventilating shaft, which opened just in front of her bedroom window, the course of the disease was so extremely rapid and without marked intestinal symptoms that we thought it highly probable the germs had entered the body through the lungs.

Great care must be taken with regard to *soiled* linen, and mattresses must be suitably protected from penetration by the discharges. The body and bed linen, before removal from the bedroom, should be plunged into a 2 per cent. solution of carbolic acid, and at once conveyed to the laundry and plunged in boiling water and kept in boiling water for half-an-hour, and then washed with soap. The bed-clothes must not be shaken; those that do not come in contact with the body of the patient should be aired for eight hours daily. The feeding vessels should be frequently cleansed with boiling water. After action of the bowels the patient's nates should be cleansed with moist carbolised tow or cotton wool, which should be immediately burnt. After the cure or departure of the patient, the air of the room may be disinfected by burning sulphur in the proportion of 5 drachms to each cubic metre, the room being hermetically closed for twenty-four hours. The room should be washed, and all dust removed by wet clothes wrung out in 5 per cent. carbolic or 1 in 1,000 sublimate solution. The room should be exposed to the air for at least a week before reoccupation.

As a further measure of disinfection, which is also refreshing and useful to the patient himself, we have recommended that his body should be lightly sponged, all over, twice a day, with the following cooling antiseptic and aromatic lotion :—

℞ Thymol	40 grains.
Spirit. lavandulæ	2 oz.
Spirit. vini rectif.	3 ,,
Acid. aceti dil.	3 ,,
Aquæ rosæ	ad 16 ,,

M. f. lotio.

His skin is thus kept cleansed from contamination by excretions, and the temperature is reduced and a cooling tonic influence is produced. It is also a good plan to cleanse the mouth two or three times a day by washing it out with some Listerine and water (1 in 10 or 20). If the patient is unable to do this for himself, the nurse should cleanse the gums and teeth by means of a bit of cotton wool tied to the end of a stick dipped in the above mouth-wash.

The air of the sick-room is freshened by placing pieces of blotting-paper, saturated with eucalyptus oil or pinol, on plates about the apartment.

Having established these prophylactic measures, we may next consider what are the indications which should govern the medical management of the patient. We would suggest that there are two plain indications in the treatment of this disease. The one we would call *general*, because it applies to all acute febrile maladies, and the other *special*, because it applies in an especial manner to the disease we are now considering.

The *general* indication is of great importance ; it is to support and strengthen the resisting powers of the organism while it is passing through a serious crisis. The *special* indication is not of less importance ; it is to diminish the gravity of this crisis by opposing and counteracting, in whatever way we can, the morbid activities of the specific microbe with which the organism has become infected.

We have argued elsewhere * as to the urgency and practicability of fulfilling this *special* indication, and it is not necessary to occupy space here in repeating arguments which are now almost universally accepted by the representatives of modern medicine.

We will first consider the best means of carrying out the **general indication**—that is, the maintenance of the patient's strength.

It is of the greatest importance that the patient should be kept absolutely at rest in bed from the commencement of the fever. Removal to any distance, as for the sake of being nursed at home, must be stoutly resisted. The physical effort and exhaustion attending a long journey, in the early stage of the fever, has compromised many chances of recovery. When referring to prophylaxis we pointed out the care that should be given to the selection and preparation of the sick-room. The bed should be arranged so as to be thoroughly comfortable to the patient. The mattress must not be *hard*, or bed-sores may soon be induced. "A woven-wire bed, with soft hair mattress, upon which are two folds of blanket," will be both smooth and elastic. A water-proof cloth should be under the sheet. The patient should not be exposed to a glaring light; at the same time, it is quite needless to darken the room so much as is often done. In hot weather the air of the room may be cooled by means of a block of ice; in winter it should be kept at about 65° F. It is needless to say that one or two good nurses will be required, according to the severity of the case. Great cleanliness of the body of the patient should be enforced by regular cold sponging with water or with the lotion we have already mentioned. It is as well to cut the hair short in severe cases, since it is apt to fall out during the illness, and cold applications to the head can be better applied, if they are needed. The value of two beds—one for day and the other for night—has been mentioned; it greatly favours cleanliness, it refreshes the patient, and it gives the opportunity of some little change of position, which, in protracted cases, may avoid the formation of bed-sores. The state of the bladder should be noted in cases with defective consciousness, and the urine withdrawn by catheter if necessary.

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* "The Treatment of Typhoid Fever, especially by Antiseptic Remedies." 2nd edition. Cassell and Co. 1892.

The question of **diet** is a most important one. We have elsewhere * considered at length the dietetics of fever, and we may repeat here the two principal rules that we have there formulated:—1st, To endeavour to utilise food to the greatest extent that is safe and possible, for the purpose of checking the waste of tissue associated with the febrile process. 2nd, To administer no food that cannot be readily absorbed and assimilated; and, seeing that the functions of the digestive organs are gravely impaired, if food is given that the patient is unable to assimilate, it will decompose in the stomach and intestines, become a local irritant and augment the fever, and add seriously to the discomfort and danger of the patient.

The popular tendency undoubtedly is to **over-feed** the typhoid patient. We should bear in mind that in the acute stage of fever scarcely any food is absorbed by the stomach. Nearly all digestion is intestinal, and that also is seriously impaired, as all the digestive secretions are greatly diminished. Excess of zeal in feeding fever patients is the cause of much of the intestinal trouble that complicates these cases. Strong beef-tea and meat extracts, milk, port wine, brandy, beaten-up eggs, gruel, etc., are given the patient in rapid succession, to accumulate in his intestinal canal and form a fermenting mixture, in which poisonous ptomaines may be abundantly formed; while pure cold water, one of the best of eliminators and antiseptics, is often withheld. It is not to be wondered at that tympanites and painful flatulent distension of the bowels arise from such feeding. In feeding a case of typhoid we should carefully note the digestive and absorptive capacity still retained by the patient, and the food should be kept within that limit. Excellent a food as milk is, it is a concentrated food,* and is apt to coagulate in the stomach and intestines into a *solid* curd, which may excite much irritation of the ulcerated and inflamed mucous membrane, and be passed by the bowel quite undigested. We should always be on the look-out for this, and in order to avoid it we should always give the milk freely diluted with some alkaline water, such as Vichy or Apollinaris; or a convenient and cheaper plan is to give the nurse some powders, each containing 3 grains of bicarbonate of soda, 3 grains of bicarbonate of potash, 2 grains of magnesia, and 3 grains of common salt, and let her add one such powder to each cup of milk and water. This will not only aid the digestion of the milk, but it will add certain necessary salts to the food which, in the absence of vegetable foods, the patient does not get, and common salt is an excellent antiseptic.

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* "Food in Health and Disease," part ii. chap. i.

We would insist also that *strong* beef-tea is by no means a good food for the average typhoid patient, and when given with sweet port wine it probably forms a mixture most prone to excite septic changes in the diseased intestine. As the patient needs a large quantity of water, there is absolutely not the smallest excuse for giving these *concentrated* meat extracts. It is far better to give weak broths and light clear soups, flavoured with the expressed juice of a little fresh vegetable and savoury herbs boiled in it.

The blood in typhoid—at any rate during the height of the fever—is poor in water,† and the free supply of pure water to the patient is an urgent duty. It may be given, if preferred, in the form of barley-water (iced if the temperature is high), and this contains a small amount of carbohydrate.* It has been calculated that at least 80 ounces of water should be taken by the fever patient in 24 hours, or about 3 to 4 ounces every hour. As, however, his food will be all fluid, we may include it in the estimate. Food and drink (of which one-half should be practically pure water) should amount to about 4 pints in the 24 hours, rather more than less. In *severe* cases, during the day, from 8 a.m. to 10 p.m., food or drink should be given every hour—drink one hour and fluid food the next—about 4 ounces each time. This will consume 60 ounces, or 3 pints. The remaining pint should be given at convenient intervals through the night. Two to 3 pints of milk, or the equivalent of 2 to 3 pints of milk (remembering that this represents the solid matter of two to three large mutton chops !) will be an adequate allowance for most cases, and 2 pints of barley-water may at the same time be given. If milk, however treated, disagrees, as it will with some cases, and curd of milk is found in the motions, it will be best to convert the milk into *whey.* This can readily be done by boiling each pint of milk with a tablespoonful or two of lemon-juice and straining through muslin, strongly expressing all that can be expressed from the curd. Or we may try whether peptonised milk is well tolerated. If we use whey, then we can easily supply the albuminous constituent, which we lose in the curd, by beating up a new-laid egg with two teaspoonfuls of brandy, and then adding 2 or 3 ounces of hot whey and straining if necessary. Two or three eggs may be given thus prepared in the day. Little other food than this is needed during the febrile period and before the period of exhaustion sets in. There can be no objection, however, to either of the following fluid foods and drinks:—Light beef-tea, veal or chicken broth, clear consommé, peptonised gruel (strained), peptonised beef, chicken or milk jelly (made by adding a little isinglass to hot peptonised milk), calf's-foot jelly, butter-milk, albumen-water (made by mixing white of egg with twice as much water and straining)—this is a good vehicle for alcoholic stimulants when they are needed—small quantities of tea, coffee or cocoa occasionally, home-made lemonade, orange and other fruit juice with water, iced champagne and seltzer water if the stomach is irritable, and Semmola's glycerine drink * is very useful for relieving the dryness of the mouth and throat.

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* Sir William Jenner has pointed out that "a pint of milk contains as much solid animal matter as a full-sized mutton chop," and he has protested against the practice of giving large quantities of milk to typhoid patients (*Lancet*, vol. ii., 1879).

† See the observations of Professor F. P. Henry: Hare's "System of Practical Therapeutics," vol. ii. p. 289.

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* Barley-water is thus made:—On a tablespoonful of pearl-barley (washed in cold water), the rind of a lemon peeled thin, and a little sugar-candy, pour a quart of boiling water. Let it stand seven or eight hours, and strain. Add the juice of the lemon, unless objected to by the patient. If used for diluting milk, it must not contain lemon-juice.

With regard to the administration of **stimulants** in typhoid, we protest strongly against their *routine* use. Cases of moderate severity in young people do exceedingly well without any alcohol; indeed, we regard alcohol, in cases of moderate severity, as of far more use during convalescence than during the fever. There are very few cases that are not the better for a glass or two of port wine daily during the early part of convalescence.

We should not give alcohol in the early stages until some decided indication arises for its use, and we should begin with small quantities: 4 ounces of whisky or brandy, well diluted, in the 24 hours—*i.e.* a tablespoonful every three hours. Larger quantities must be given when signs of great exhaustion appear, such as a weak, irregular pulse, feeble cardiac first sound, a dry, brown, tremulous tongue, sinking in the bed, muttering delirium, or a low, somnolent mental condition, with motions and urine passed unconsciously. As a rule, the older the patient the greater and earlier will be the need of stimulants.

Restlessness and sleeplessness at night will sometimes be relieved by a full dose (1½ to 2 oz.) of brandy or whisky given the last thing with the food. We have seen an ounce of brandy send a convalescent, sleepless patient to sleep in a few minutes. It is important that the spirit we use should be pure. Whisky and brandy we consider the best stimulants *during* the fever, port wine and champagne during convalescence.

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* Made by mixing an ounce of glycerine and 30 grains of citric acid with a pint of water.

We will next consider the **special** indication in the treatment of typhoid, and also the treatment of certain symptoms and complications. We have shown elsewhere that the idea of an **antiseptic** treatment of typhoid fever has long been in the minds of practical physicians,* and is to be found in the writings of Murchison, Watson, Jenner, and others. But the growing knowledge of the manner in which pathogenic microbes infect the organism, and the evidence that has recently been forthcoming that their toxic effects may be antagonised by remedial measures, have given a remarkable impulse to the application of the antiseptic idea in the treatment of those maladies which are distinctly traceable to the invasion of the human body by such organisms; and what is known of the nature of the characteristic lesions of typhoid fever simply imposes on us, as an imperative duty, the necessity of adopting a method of treatment which will include, as an essential part of it, the attempt to realise **intestinal antisepsis.** We have no hesitation in saying that the practitioner who, in the face of the evidence that has recently accumulated, neglects to take measures to promote intestinal antisepsis in typhoid, incurs a very grave responsibility.

In the small intestine especially, the influence of the specific infective bacillus in setting up serious structural changes, often leading to fatal consequences, is well known; and it seems probable that these consequences may be contributed to, in a notable degree, by a loss of power of resistance, in the specifically diseased tissues, to the attack of non-specific putrefactive micro-organisms which are always present in the intestinal canal; so that intestinal antisepsis is as much needed to counteract the local injurious influence of non-specific, as of specific micro-organisms. But we also know that the activities of the typhoid bacillus is not limited to the intestine, but that it passes through the walls of the intestine into the blood, and is always to be found in that of the spleen. An antiseptic action on the blood is therefore also indicated.

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* "The Treatment of Typhoid Fever, especially by Antiseptic Remedies." 2nd edition. Cassell and Co. 1892.

What means have we at our disposal for the purpose of carrying out these indications? We shall not now enter into the question of the value of injections of immunised serum; the subject is in far too unsettled a condition, at present, to justify any positive practical conclusions, and the tendency to be in haste to draw wide inferences from the experiments on animals which have hitherto been made is one, we consider, which should be repressed.

The chief antiseptic agents that have commended themselves for use in the treatment of typhoid are the following:—Quinine, chlorine, iodine, iodoform, calomel, carbolic acid, creasote, the sulpho-carbolates, sulphurous acid and the hyposulphites, salicylic acid, salol, boric acid, turpentine, oil of eucalyptus, thymol, camphor, the naphthols and naphthaline, resorcine, bismuth salicylate, sulphide of carbon, tannin, charcoal, etc.

We shall first describe the method that we have ourselves hitherto followed with undeviating success, and then briefly refer to those others which appear to us of greatest promise.

We have found, as Watson and Murchison had done many years ago, that of all antiseptic remedies free chlorine is one of the most efficacious. "I have repeatedly found it," says Murchison, "to have a beneficial influence upon the abdominal symptoms." We use a solution made in the following manner:—Into a 12-ounce bottle put 15 grains of powdered potassic chlorate, and pour on it 60 minims of strong hydrochloric acid. Chlorine gas is at once liberated. Fit a cork into the mouth of the bottle and keep it closed until it has become filled with the greenish-yellow gas. To hasten this you must keep shaking the mixture of acid and chlorate. Then pour water into the bottle, little by little, closing the bottle, and well shaking at each addition until the bottle is filled. You will then have a solution of free chlorine, together with some undecomposed chlorate of potash and hydrochloric acid, and probably one or two bye-products.

It is necessary to see that the dispenser does not fill the bottle too rapidly with water, or the chlorine will be driven out of the bottle by the water instead of being dissolved in it.

This preparation of chlorine has appeared to us much preferable to the liquor chlori of the British Pharmacopœia; it is pleasanter to take, and we have had much better results with it.

To 12 ounces of this solution, for an adult, we add 24 to 36 grains of quinine and an ounce of syrup of orange-peel, and we give an ounce every two, three, or four hours, according to the severity of the case—that will be from 12 to 36 grains of quinine in the 24 hours.

We have for some years past treated all our typhoid fever cases, except the very mild ones, which have not appeared to us to require any active medical treatment, on this system.

In giving this mixture to a typhoid fever patient, one of the first results you will notice is a remarkable cleaning of the tongue. You will scarcely ever find a dry, dirty, thickly-coated tongue in a patient who has been early put on this mixture. Another most important change has been noticed again and again and reported to us by the nursing sisters in our hospital: it is that the fœtor of the evacuations, which have often been very offensive, will usually disappear within twenty-four to forty-eight hours of the commencement of this treatment.

We might expect that this mixture would be wholly absorbed in the stomach, and that it would not reach the lower part of the small intestine directly. But, no doubt, stomach absorption, as well as secretion, is much depressed in these cases, and this mixture seems to pass on, in great part unabsorbed, into the small intestine, for the hospital sisters report a distinct odour of chlorine in the alvine evacuations. And in a fatal case, observed by Dr. Edwards, of the Bootle Fever Hospital, in which this mixture was given—a "very severe case," and not sent into hospital until the third week—he found "enormous" ulceration, and that the "ulcers were dyed of a greenish-brown colour; the milk seemed to have been well digested, and the fæces were not at all offensive." But much of this mixture is, no doubt, absorbed into the blood, and in this way we not only obtain *intestinal* but also *general* antisepsis.

Those who have objected to the use of quinine in typhoid fever have only objected to the enormous doses which have been advocated by some physicians—doses capable of producing toxic effects. We have never given such doses, nor have we ever found it necessary to exceed the very moderate doses we have here mentioned. We may state, in this connection, that we have found the efficacy of quinine in febrile states very much influenced by its mode of administration, and we have especially noticed this in giving quinine in pneumonias and in influenza. If we prescribe the quinine dissolved in citric acid, and given in effervescence by adding it to an alkaline mixture, doses of two or three grains exert a powerful antipyretic influence, far greater than that obtained by the same quantity of quinine given in the dry state.

We consider this a very important observation as to the action of quinine, because we have seen abundant reason to believe that, in infective fevers, if quinine be given in saline solutions, it is the most active and reliable *anti-toxin* we at present possess.

There exists a great misapprehension as to the need of *very large* doses of quinine in such cases. The great error has been in giving it in the solid form, and not in the necessary combination.

The following good effects have appeared to us to follow this *antiseptic* method, and we have published the particulars of cases so treated elsewhere.*

1. A modification and sustained depression of the febrile temperature. 2. An abbreviation of the average course of the fever. 3. A remarkable maintenance of the physical strength and intellectual clearness of the patient, so that there has been far less need of stimulants. 4. A greater power of assimilating food. 5. A remarkable cleaning of the tongue. 6. A deodorisation of the evacuations. 7. A more rapid and complete convalescence.

We are disposed to refer the effect on the temperature to the influence the chlorine and quinine exert on the activities of the infective organisms, or on the results of these activities; for, unlike the effect of mere antipyretics, the temperature does not fall immediately; it usually takes about forty-eight hours before this treatment notably affects the temperature.

The free hydrochloric acid in this mixture is also of undoubted value. It is itself an antiseptic, and it certainly favours the assimilation of food. Bouchard thinks, as we do, that quinine acts as a *general* antiseptic, and it has indeed been found to check the culture of the typhoid bacillus. Grancher has tested its effects, especially in typhoid in children, and has found them "remarkable;" and he, also, believes it to have a specific antiseptic action in this disease. Liebermeister, Voit, Pécholier, and many others, have borne testimony to the value of quinine in typhoid.

The antiseptic action of **calomel** is in part due to its direct bactericidal effects, and in part to its purgative action, sweeping the intestine clean of decomposing ingesta and of putrefactive bacteria. Liebermeister gave calomel to every case that came under treatment before the ninth day of the fever—a dose of 8 grains three or four times in the first twenty-four hours—and he found he had better results than before. He found that it shortened the duration and lessened the intensity of the disease. If we see cases of typhoid early, and if there is no marked abdominal tenderness and not much diarrhœa, it is as well to begin the treatment with two or three full doses of calomel (3 to 5 grains), for, by clearing out the bowels thoroughly at first, it will be much easier to maintain intestinal antisepsis afterwards, especially if we avoid irrational and injurious over-feeding; and we shall have less hesitation, in a more advanced stage, in keeping the bowels absolutely at rest, as is positively necessary, when certain complications threaten. It has been said that "purgation and antisepsis are, to some extent, interchangeable terms." An aperient expels the toxic ptomaines and other decomposing substances from the intestinal canal, and, if given in the early stages, may actually prevent subsequent serious diarrhœa.

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* "The Treatment of Typhoid Fever." (Cassell & Company.)

But the use of aperients, to be perfectly safe, must be limited to the first ten or twelve days of the fever. Indeed, we would limit their use to the initial cleansing of the bowel; for *rest* of the inflamed intestine is also an important condition of safety. The great risk in giving aperients in the later stages is the possibility of the existence of deep ulceration in the ileum; and in that case, as Sir William Jenner has pointed out, an aperient may mean the difference between life and death to the patient. At that period of the disease intestinal antisepsis can only be safely secured by the use of such other intestinal antiseptics as we shall now pass on to notice.

Very brilliant results were obtained by Dr. Wilks, of Ashford, during a severe outbreak of typhoid, by the use of *sulphurous acid.** He gave the acid in doses of 3 to 20 minims, according to the age of the patient, every four hours, for a week or ten days or longer; the larger dose for adults. "Of the 171 cases who took sulphurous acid, not one lost his life, and there were few who were not convalescent within fifteen days of commencing the treatment."

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* Published in the *British Medical Journal* so long ago as 1870.

Iodine, although highly commended by Liebermeister, and *iodoform* are too irritating to the gastro-intestinal mucous membrane to render them desirable agents for this purpose.

Naphthalin, although an effective intestinal antiseptic, is not so safe an one as either the *β-naphthol* or the *a-naphthol.* Bouchard, whose criterion of an intestinal antiseptic is insolubility, so that it may not exert any toxic or irritant action on the stomach, or be absorbed there, commends β-naphthol for this purpose, reduced to a fine powder, and mixed with *salicylate of bismuth.* One hundred and fifty grains of β-naphthol are mixed with 75 grains of salicylate of bismuth, and this is divided into thirty powders. From three to twelve of these are given in the twenty-four hours, enclosed in a wafer and swallowed with the food. The β-naphthol has the advantage of being very slightly soluble in water, but it is a powerful antiseptic; it therefore reaches the intestine, where it acts as an intestinal antiseptic.

M. Maximovitch recommends α-naphthol as preferable to β-naphthol. It is three times less toxic; and as to its antiseptic value, he found 1 part in 10,000 would prevent the development of the typhoid bacillus, as well as that of many other septic microbes in ordinary cultivation fluids.

Dr. Teissier, of Lyons, also prefers α-naphthol for producing intestinal antisepsis in typhoid fever. He gives it in 6-grain doses, combined with salicylate of bismuth, and he at the same time promotes free diuresis by cold-water enemata. He considers that the naphthol acts by sterilising the bacterial products in the intestine.

Thymol is preferred by some; it is innocuous in full doses, and possesses an antiseptic power four times as great as that of carbolic acid. It is insoluble, so that it is certain to reach the small intestine.

Prof. F. P. Henry * states that in his experience "the typical symptoms of typhoid fever will rarely develop if thymol is administered during the first week of the disease." It may be given in doses of 2 to 3 grains every three hours, made into a pill with soap powder and a little spirit, and these should always be given with the food.

Carbolic acid has been warmly advocated by Prof. Charteris and others in the treatment of typhoid, but Dujardin-Beaumetz has objected to it on account of its toxic properties. Charteris † has, however, shown that, although the ordinary acid, which has a melting-point of 33° C., is highly toxic, the pure acid, with a melting-point of 40° C., is not so; and it is with the latter he has obtained such good results in the treatment of this disease. Dr. Sloan, of Galashiels,‡ who has given this method a trial in several cases, reports that with a pill of 2½ grains three times a day "the fever was cut short, no grave symptoms ensued, and the process of recovery was quick and attended by no wasting."

The *sulpho-carbolate of zinc* has been largely used by Waugh, of Philadelphia, as an intestinal antiseptic in typhoid, and he maintains that it has many advantages over some of the preceding; it is tasteless, inodorous, and unirritating. He gives 2½ grains in keratin-coated pills every two hours until the stools lose their offensive odour, then less frequently. He has treated over 100 cases in this way without a death, and he gives sound reasons for believing that the disease was averted in some instances when treated at the onset.

Turpentine is recommended by H. C. Wood as of especial value about the end of the second week, when there are signs of progressing intestinal ulcerations. His formula will be found at the end of the chapter. He considers its volatility a great recommendation, as the ulcerated surface is bathed by the antiseptic vapour.

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* Hare's "System of Practical Therapeutics," vol. iii. p. 307.

† See *British Medical Journal*, Dec. 31, 1892, and March 25, 1893.

‡ The carbolic acid is made into pills of 2½ grains "with some innocuous powder and covered with keratin." They are prepared by Macmillan, of Glasgow.

Boric acid has recently been tried with excellent results by Tortchinsky.* After the action of an aperient of castor oil with a few drops of turpentine, boric acid, in doses of 10 to 15 grains for adults, was given three or four times a day, in some cases combined with quinine. He considers this method "the cheapest, simplest, most harmless, and most efficacious of all yet known."

Salol has also been found an efficient intestinal antiseptic. *Oil of eucalyptus* has been given with remarkable results by Kesteven, of Brisbane; *camphor* by Janaway, of New York; *creasote* by Pécholier, of Montpellier; *sulphide of carbon* water by Dujardin-Beaumetz.

In all these instances the idea and the indication have been the same, and the good results reported are almost identical with those we have tabulated as derived from the chlorine and quinine treatment, which we still prefer. If we had to select, from the other antiseptic agents referred to, the most suitable drugs for the purpose, we should choose thymol, sulpho-carbolate of zinc, and in some cases turpentine.

Many of the milder cases no doubt need no treatment beyond rest in bed and a careful diet; but by way of precaution we should begin by a calomel purge, and give three or four doses of the quinine and chlorine mixture daily, and even in the mildest cases this treatment will be found to shorten the attack and promote early convalescence.

There can scarcely be a doubt that the future treatment of typhoid fever will be more and more an antiseptic one, and that the mortality from this disease will thereby be greatly diminished.

We have now to consider briefly the treatment of certain **complications**, such as high temperature, severe diarrhœa, hæmorrhage, perforation, etc.

With regard to the occurrence of **high tempera-**

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* *Gazeta Botkina*, No. 48, 1892.

ture, we think it an error to regard the elevation of temperature in typhoid as a thing to be attacked as if it were itself the disease; it is but a sign of the intensity of the activities of the infective agent, and we rejoice to see the temperature fall as a result of our treatment, because we believe that we have lessened the virulence of the infection. We have attacked the cause, and the effect is weakened. But there is small ground for rejoicing over the administration of large doses of a depressing antipyretic which may lower the temperature several degrees for a few hours, when we shall see it rise again, unless we re-administer the antipyretic in doses which are often really toxic. We would therefore discard altogether from the treatment of typhoid fever the *depressing antipyretics*, or reserve their use absolutely to certain cases of hyperpyrexia, when we may be precluded from the application of other and safer depressors of temperature. But unless the temperature rises and keeps above 104°, and the patient's general condition seems unfavourably affected thereby, we do not see any urgent indication for directing our treatment especially to the reduction of the temperature. But when the temperature rises and keeps above 104°, with but slight morning remissions, and our antiseptic measures fail in effecting a reduction, we should certainly adopt some means of lowering the temperature, as in itself an injurious symptom.

It is impossible here to enter fully into the discussion of the value of **cold baths** in the treatment of this disease. The best results from their use have been obtained in Germany, and it is quite possible that the German constitution bears this treatment better than the English or the French, for it has never gained *general* acceptance either in England or France. We are satisfied also that it is much more appropriate to the rougher class of hospital patients than to the more sensitive organisations encountered in private practice. We have seen such very serious and lamentable results follow its application, in some of the latter class, that we should hesitate to sanction its use except in quite exceptional circumstances.

Besides, there is much difficulty in carrying out this method in private houses, and the fatigue to the patient attending it should not be overlooked.

Dr. Barr, of Liverpool, following the example of Reiss, has treated patients by prolonged immersion in a specially-constructed tank filled with water kept at a constant temperature of 90° to 95° F., and here the patients have remained for periods varying from three to thirty-one days. The inconveniences attending this method are so obvious, that, unless we had no other successful method to fall back upon, there seems no sort of reason for adopting it. But from what has preceded, it will be manifest, that we can rely upon excellent results, by other methods, which call for no such eccentric arrangements.

But we are enabled to apply cold, in an effective manner, to reduce hyperpyrexia without the necessity of having recourse to the cold bath. The patient can be enveloped in a cold wet sheet for a minute or two, then rubbed over with dry towels and returned to bed; when there are two beds, side by side, this is easily carried out. Or the surface of the body may be rapidly cooled by quickly and repeatedly passing over it a large smooth piece of ice enveloped in thin flannel, the patient being turned over on his side while it is being applied to the back, when it should be passed several times along the spine. Also an ice-bag may be applied to the back of the neck, and another to the head. A few ounces of ice-cold water may also be injected into the rectum from time to time. All these are useful measures for reducing hyperpyrexia and the nervous excitement and exhaustion connected therewith.*

In such cases, if it were thought needful, we should not object to a few doses of phenacetin, the safest of the depressors of temperature, given in combination with quinine. We give quite small doses, but we have found them act well—2 grains of phenacetin with 1 grain of hydrobromate of quinine every hour until the temperature has fallen two or three degrees, then every two or three hours.

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* Dr. Fenwick has suggested a method of cooling the air around the patient by covering him with a cradle, which keeps off the bedclothes, and suspending small zinc buckets filled with ice from the cross-bars of the cradle (*Clinical Journal*, Feb. 15, 1893).

Next as to the treatment of **diarrhœa.** If we have followed the principles of intestinal antisepsis already set forth; if we have commenced by sweeping the intestine clean by calomel or some other simple aperient; if we have cautiously regulated the diet so that no accumulations of food could possibly linger in the intestine to undergo fermentation and cause irritation from its presence; if we have stedfastly administered one or other of the intestinal antiseptics we have recommended; and if, notwithstanding, diarrhœa continues or arises, and is attended with abdominal tenderness and tympanites; and if on inspection we find the evacuations fluid and quite free from curd of milk or other undigested food, then we may conclude that it is due to the intensity of the ulcerative and catarrhal processes set up in the small intestine, and that the indication is to arrest it and keep the intestines as completely at rest as possible. Nothing does this so well as opium, and no mode of giving opium is so suitable as small enemata. We also prefer solid opium, which is absorbed slowly, to any liquid form, which is absorbed too quickly, and will, if a full dose be given, sometimes act unfavourably on the heart and nervous system. We give 5 grains of Dover's powder and 10 grains of tannin mixed with an ounce of gum mucilage, and we order this to be mixed with 2 or 3 ounces of warm water, arrowroot, or thin starch, and to be injected with a small 10- or 12-inch tube as high up as it can be passed after each action of the bowels. For children we reduce the quantity of Dover's powder. Internally we should give salicylate of bismuth, 5 grains, with carbonate of bismuth, 5 grains, mixed up with a little mucilage and cinnamon water, and this may be given every three hours until the diarrhœa has ceased. Other remedies for this symptom will be found in the appended formulæ.

If there is much tympanites and abdominal tenderness, a flannel sprinkled with a mixture of equal parts of opium and turpentine liniment should be kept applied to the abdominal surface. Professor Henry says: "I have not seen, in my own practice, a case of typhoid fever with excessive meteorism for several years." Nor will such cases be seen if intestinal antisepsis be practised, and if the rules we have laid down as to feeding be observed. The careful passage of a rectal tube is occasionally needed to relieve excessive distension brought on by unsuitable and excessive feeding.

Hæmorrhage is a very serious symptom, and calls for prompt measures for its arrest; its occurrence is often indicated by a sudden fall of temperature. No measure is so serviceable as the arrest of all intestinal movement. We must do our best to keep the intestine absolutely at rest. We have kept the bowels inactive and completely at rest for more than fourteen days in order to avoid the danger attending a recurrence of serious hæmorrhage, and then we have only allowed the bowels to act after an enema of olive oil injected with a long tube.

On the occurrence of hæmorrhage we use immediately the enema of Dover's powder and tannin we have just referred to, but we increase the dose of Dover's powder to 10 grains. Indeed, in all cases of typhoid we usually order such enemata to be kept ready at hand, to be administered immediately if hæmorrhage occurs. We are satisfied that lives have been saved by this precaution. At the same time we order the following mixture by the mouth:—

℞	Glycerini acidi gallici	6 drams.
	Acid. sulphurici aromat.	80 minims.
	Liq. opii sedat.	40 „
	Aquæ cinnamoni	ad 8 oz.

M. f. mist. Two tablespoonfuls every three hours.

We allow no food that can leave any unabsorbed residue, and all food should be given cold, and we allay thirst by means of small quantities of iced water. A soft, broad flannel binder applied firmly, but not tightly, round the abdomen no doubt helps to keep the intestines at rest and still. Ergot or ergotine may be injected hypodermically, but we should prefer to trust to the measures we have described.

Perforation *of the intestine*, indicated by sudden severe pain, collapse, fall of temperature, and signs of peritonitis, requires full doses of opium given in quick succession. It offers the only chance of recovery. A grain of opium may be given every hour. A binder should be gently applied, as in the case of hæmorrhage, to restrain any movement of the intestines, and only a little water should be taken, from time to time, into the stomach. If signs of recovery appear, we must maintain enforced rest of the bowels for many days; and when it is determined to induce an action of the bowels, enemata of olive oil should be given with a long tube twice a day, and left in the bowel so as to soften the retained fæces. Soap-and-water enemata should be used for a long time, so that no straining at stool may be possible.

In addition to the special dangers of hæmorrhage, and perforation, in the advanced stages of this disease, one of the most serious conditions affecting the safety of the patient, which at that period arises, is progressive *heart failure* with *hypostatic congestion of the lungs.* This condition may require to be dealt with by energetic and sustained stimulating and tonic measures. Alcohol must be given freely, but with judgment, and it must be remembered that the alcohol we administer has to be eliminated, and the organs of elimination are not in the best state for the due performance of their functions. We prefer small and frequent doses rather than large quantities at a time, and we mix them with other cardiac stimulants, such as a strong and fresh infusion of coffee, which is too little used in such circumstances. Strychnine, given hypodermically, is one of our best resources in these cases of cardiac asthenia; beginning with doses of $\frac{1}{60}$ of a grain we may increase them rapidly, if necessary, up to $\frac{1}{16}$ grain every four to six hours. Caffeine is also a valuable cardiac stimulant at such times, and it is best also given hypodermically. Five grains, dissolved by the aid of 5 grains of sodium benzoate in 20 minims of warm distilled water, may be injected three or four times a day if needful. Hypodermic injections of ether or of ethereal solutions of camphor have also long been used for the same purpose. Digitalis is recommended by some physicians, but we prefer caffeine and strychnine as cardiac stimulants at such times.

Nervous symptoms, as delirium, insomnia, restlessness, etc., are, as we have already pointed out, usually associated with hyperpyrexia or a sustained high temperature, and they must be met by such measures for lowering the temperature as we have described. But when typhoid fever attacks persons of neurotic temperament we may find, from the first, that nervous disturbances manifest themselves independently of high temperatures; such patients require sedatives to quiet nervous excitability. Dujardin-Beaumetz and some others object to opium in such cases on the ground that it favours cerebral congestion, and they give chloral with potassium bromide at night to relieve restlessness and insomnia. We make no objection to the chloral and bromide, but no drug quiets the constitutional nervous unrest like opium; and we should advise in such cases a draught at night containing 10 to 20 minims of liquor opii sedativus with 30 minims of spirits of nitrous ether and 30 minims of sal volatile in an ounce of camphor water.

Careful nursing and cleanliness will prevent the occurrence of **bed-sores.** In protracted cases, in addition to sponging the back frequently with cold water and thoroughly drying, the application twice a day to the prominent parts of a lotion of rectified spirits with 10 grains of tannin to the ounce is a good precautionary measure.

The stage of **convalescence** in typhoid requires the most careful watching. Bearing in mind the anatomical intestinal lesions characteristic of this disease, we shall realise the fact that, for some time after the cessation of the fever, there may be only a thin layer of peritoneum between life or death to the patient. It is this *hurt* intestine that we have to think of; and it is best to be frank with the patient's friends and explain to them without any mystery the real state of the case. The craving for solid food must therefore be steadily resisted, and for ten or twelve days after the temperature has become normal no solid food should be given. The fever, which is often excited during convalescence by solid food or by even too much liquid food, is sometimes spoken of as a mysterious thing; it has been termed "febris carnis" and "febris cibi." We believe it is simply a "*fæcal fever.*" If food is given leaving much fæcal residue, the ordinary fæcal toxines will be formed, and these will be readily absorbed by the yet unhealed, or incompletely healed, ulcerated intestinal surface, and a rise of temperature will follow. The same will sometimes occur, and for the same reason, if constipation is allowed to go on, unrelieved, during convalescence; and we have often shown, in cases in the hospital, that the administration of an enema of soap and water and olive oil, after it has produced an action of the bowels, is at once followed by a fall of the temperature to normal. We are therefore in the habit of securing a daily action of the bowels by such an emollient enema. Should some tendency to diarrhœa continue into the convalescent period, from a lingering intestinal catarrh, it should be checked by bismuth, the carbonate or salicylate. Nothing promotes rapid convalescence and return of strength so much as reclining for many hours a day in the open air—of course, in favourable weather. Some stimulant is usually needed during convalescence, and good, sound port wine is the best.

THE TREATMENT OF TYPHUS FEVER.

Cases of typhus fever are now rarely seen in England, either in *general* hospitals or in private practice; and as our space is limited we shall deal very briefly with the question of its treatment. All that we have said with reference to *general* indications in discussing the treatment of typhoid fever will apply also to cases of typhus. The specific germ of typhus has not yet been discovered, and as the disease would seem to be disappearing before the improved sanitary conditions now so generally enforced, there is perhaps less chance of its early discovery. It is quite possible that it is a disease amenable to antiseptic treatment, but we have no certain knowledge on the subject. Should a case of this disease be encountered, it must be borne in mind that it is highly contagious, and, from the point of view of prophylaxis, it must be isolated and dealt with on the principles we have already repeatedly referred to in the preceding chapters on infectious fevers.

There is usually more urgency for early and active stimulation and supporting treatment in typhus than in typhoid, as this disease runs a much shorter course and usually terminates by crisis on the fourteenth day. We should give frequent small doses of quinine, in effervescence, or in solution in hydrobromic acid, from the beginning, and adopt such means for reducing hyperpyrexia as we have already dwelt upon. Acidulated water should be freely given to allay thirst, and for this purpose a drink made with syrup of lemons and dilute hydrochloric acid is most useful. A dram of the dilute acid and an ounce of the syrup may be added to a pint of water, and this may be drunk almost *ad libitum*. Head symptoms and delirium are far more common in typhus than in typhoid, and shaving the head and the constant application of an ice-cap are much more necessary. In the early days chloral and bromide of potassium may be given to procure sleep, which is an urgent indication; but later it is perhaps best to trust to full doses of alcohol for the purpose, as cardiac asthenia is then a serious complication. Graves gave opium combined with tartar emetic. All the measures we have mentioned for maintaining the circulatory force, in the preceding sections, will be available here.

As there is usually constipation in these cases some gentle aperient will be required from the first. Convalescence is usually rapid and complete, and relapses are rare.

ADDITIONAL FORMULÆ.

Sulphurous acid mixture in typhoid.

℞ Acidi sulphurosi, 2 drams.
Syrupi aurantii, 4 drams.
Aquæ ad 6 oz.

M. f. mist. Two tablespoonfuls every four hours (smaller doses for children). (*Wilks.*)

Turpentine mixture for typhoid.

℞ Olei terebinth., 1½ dram.
Olei caryophylli, 6 drops.
Glycerini, ½ oz.
Mucil. acaciæ, ½ oz.
Syrupi et aquæ ad 3 oz.

M. f. mist. A dessertspoonful every two hours during the day. (*Prof. H. C. Wood.*)

Eucalyptus mixture in typhoid.

℞ Ol. eucalypti, 5 to 10 mins.
Spir. ammoniæ arom., ½ dram.
Spir. chloroformi, ½ dram.
Glycerini, ½ dram.
Mucilaginis et aquæ ad 1 oz.

M. f. haust. To be taken every four hours. (*Kesteven.*)

Salol, bismuth, and chlorodyne mixture (antiseptic).

℞ Salol, 160 grains.
Chlorodyne (B.P.), 160 mns.
Lac. bismuthi (Symes'), 2 oz.
Aquæ ad 8 oz.

M. f. mist. From 1 to 4 drams for a dose, according to age, every two hours. (*Anderson.*)

Sulpho-carbonated water for typhoid.

℞ Carbonei bisulphidi, 6 drams.
Ess. menthæ pip., 50 drops.
Aquæ, 16 oz.

Shake well in a large bottle, and allow the bisulphide of carbon to settle. Use only the clear watery solution, and renew the water as it is used. Eight to ten tablespoonfuls daily to be given in tablespoonful-doses mixed with half a glass of milk. (*Dujardin-Beaumetz.*)

Iodine and carbolic acid mixture.

℞ Acidi carbolici, 12 minims.
Tinct. iodi, 16 minims.
Tinct. aurantii, 1½ dram.
Syrupi, 3 drams.
Aquæ ad 8 oz.

M. f. mist. Two tablespoonfuls every four hours. (*Grimshaw.*)

Diarrhœa mixture in typhoid.

℞ Plumbi acetatis, 2 grains.
Acid. aceti dil., 15 to 20 mins.
Morphinæ acetatis, ⅛ to ⅙ gr.
Aquæ destill., 1 oz.

M. f. haust. (*Osler.*)

Another.

℞ Acidi sulphurici aromat., 3 drams.
Tinct. opii, 2½ drams.
Tinct. catechu, 4 drams.
Aquæ chlorof. ad 10 oz.

M. f. mist. Two tablespoonfuls three times a day, or after each liquid motion. (*Whitla.*)

Another.

℞ Extr. opii aquosi, 1½ to 3 grs.
Mucilaginis et aquæ ad 6 oz.

M. f. mist. A tablespoonful every two hours. (*Bamberger.*)

For diarrhœa of typhoid.

℞ Bismuthi subnit., 1 dram.
Morphinæ sulph., 1 grain.

M. et div. in pulv. 12. One to four a day. (*Alonzo Clark.*)

Pills for the same.

℞ Argenti nitratis, ¼ grain.
Extr. belladonnæ, ½ grain.
Extr. opii aquosi, ⅛ to ½ gr.

M. f. pil. To be taken three times a day after food. (*Prof. Pepper.*)

For hæmorrhage in typhoid.

℞ Ergotini, 12 grains.
Syrupi limonis, ½ oz.
Aquæ destill. ad 3 oz.

M. f. mist. A tablespoonful every hour. (*Bamberger.*)

Powders for the same.

℞ Plumbi acetatis, 1½ to 3 grs.
Opii pulv., 1½ to 3 grains.
Sacchari alb., 60 grains.

M. et divide in pulv. 6. A powder every three hours.

Or.

℞ Aluminis, 60 grains.
Opii pulv., 5 grains.
Sacchari alb., 120 grains.

M. et divide in pulv. 12. One every three hours. (*Bamberger.*)

Mixture for the same.

℞ Acidi tannici, 10 grains.
Tinct. opii, 10 minims.
Spr. terebinth., 15 minims.
Mucilaginis, 2 drams.
Tr. chloroformi co., 20 mins.
Aquæ menthæ pip. ad 1 oz.

M. f. haust. To be taken every two hours. (*Murchison.*)

Mixture for sleeplessness in typhoid.

℞ Liquor. morphinæ hydrochlor., 1 dram.
Sodii bromidi, 45 grains.
Syrupi aurantii, 3 drams.
Aquæ chloroformi ad 2 oz.

M. f. mist. Half to be taken at bed-time, and the remainder in three hours, if necessary. (*Whitla.*)

Acid mixture in typhus.

℞ Acid. nitro-hydrochlor., ½ dr.
Spr. ætheris nitrosi, 4 drams.
Aquæ camphoræ ad 6 oz.

M. f. mist. A tablespoonful every two or three hours. (*Hartshorne.*)

Stimulating mixture in typhus.

℞ Pulv. moschi, 10 grains.
Mucilaginis acaciæ, 2 drams.
Syrupi aurantii, 2 drams.
Aquæ camphoræ, ½ oz.

M. f. haust. To be taken every five or six hours. (*Murchison.*)

Mixture for adynamic restlessness in typhoid.

℞ Liq. opii sedat., ½ dram.
Spiritus ætheris, 1 dram.
Aquæ camphoræ ad 3 oz.

M. f. mist. Two tablespoonfuls every hour until sleep is induced. (*Murchison.*)

Sedative mixture in typhus.

℞ Potassii bromidi, 3 drams.
Chloral hydratis, 1 dram.
Aquæ ad 6 oz.

M. f. mist. A tablespoonful every two hours. (*Charteris.*)

Tonic mixture for convalescence in typhus.

℞ Quininæ sulph., 30 grains.
Acid. nitro-hydroch. dil., 4 drams.
Tinct. calumbæ, 1 oz.
Tinct. quassiæ, 1 oz.
Inf. aurantii ad 8 oz.

M. f. mist. A tablespoonful in a wineglass of water three times a day before meals. (*Whitla.*)

CHAPTER IV.

THE TREATMENT OF INFLUENZA; OF MALARIAL FEVERS; AND OF TETANUS.

INFLUENZA.—The recent Epidemic—Difficulties in its Investigation—Misleading Methods—Fatal Pulmonary Complications in the Feeble and Aged—The Avoidance of serious After-effects of chief Importance in Treatment—The Dangers of trusting too much to Analgesic and Antithermic Drugs—Need of Tonics from the first—Quinine a real Anti-toxine—Cases—Many require no Drug Treatment—Certain Symptoms need careful Management—Indication: To antagonise a Bacillary Toxine—High Temperature, Headache, and Gastro-intestinal and Muscular Pains—Laryngo-tracheal Cough—Bronchitis and Pneumonia — Gastro-intestinal Catarrh — Cerebro-spinal Cases—Cardiac Asthenia—Some Remedies.

MALARIAL FEVERS.—A Telluric Infection—*The Plasmodium Malariæ*—Forms of Malarial Infection—The Relation of Quinine to Malarious Infections—Various Modes of Administering Quinine—Management of the Attacks of Fever—The Intermittent, Remittent, and Pernicious Forms—Malarial Cachexia.

TETANUS.—A Bacillary Infection—Characteristic Symptoms—Treatment—Tetanus Anti-toxine.

Additional Formulæ.

AN epidemic of **influenza**, which had not been known in Great Britain since 1847–48, re-entered England from the European continent at the end of 1889. It spread widely during the spring of 1890, was present in various parts of the country in the winter and spring of 1890–91, and at the end of the latter year and the commencement of 1892 assumed alarming proportions and was attended with great mortality. In the spring of 1893 it was still in the country in the form of scattered cases; but the outbreak reached its height in London in January, 1892. Since then it has declined, and we may now hope it is nearly exhausted.

With so protracted a visitation of this malady, and such extended opportunities for its observation and study, we might have hoped to obtain more exact knowledge of its nature, causation, and appropriate treatment. Some knowledge we probably have gained on these points, but it cannot be said that our knowledge has grown in proportion to our opportunities. Although the disease appeared in England at the end of 1889, it was not until the winter of 1891–92 that serious alarm began to be felt at its progress and its severity, and that due attention began to be paid to the gravity and variety of its **after-effects.** A disease which varies so greatly in its incidence on different persons, which arouses such a variety of morbid phenomena in different organs in those it attacks, and with regard to which, the reaction of different constitutions to its specific poison is so varied, obviously presents special difficulties to the investigator. In a great number of instances, especially at the commencement of the epidemic, the attacks were so slight that no more attention was paid to them than to an ordinary cold.* When practitioners attempt to give an *universal* application to inferences drawn from the results of medicinal treatment in these slight cases, they hinder rather than promote progress; or when a practitioner advertises the fact that he has given potassium bicarbonate in 500 cases without a death, and another that he has given salicin in 1,000 cases *without a death*, they make statements that are worse than useless, because they are misleading.

We did not see one *fatal* case of influenza, either in hospital or private practice, until the end of January, 1892, when we saw three fatal cases in one week. They were three old and feeble persons nearly 80 years of age—one the subject of chronic asthma and the others of chronic bronchial catarrh. In *all* the fatal cases we saw, which were directly referrible to influenza, death was caused by broncho-pneumonia in aged people; and the secretion of an extremely *tenacious adhesive mucus* in their bronchial tubes, which they could not expectorate, seemed to be the direct cause of death. They had, what has been particularly noted, viz. coarse and fine crepitations, and widely diffused bronchial râles *without any expectoration.* They were drowned, as it were, with their own bronchial exudation, which was of a peculiar tenacity. If we had possessed a remedy which could have rendered these secretions fluid and less tenacious, we might have saved even these patients.*

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* The writer had two attacks in the spring of 1890, at an interval of six weeks. Each attack lasted three days, during which the temperature rose to 101° F. But they were so slight in their general effects that he was not confined to the house a single day, nor did he find it necessary to take medicine.

But so far as attacks of simple, uncomplicated influenza are concerned, there is no question of a *fatal* result, and our treatment should be directed *especially* to the avoidance of those serious *after-effects* of which we have recently seen so much, and which have appeared precisely in those patients who have been treated with some of the most highly-vaunted *remedies!*

There are many remedies that will relieve the common early symptoms of influenza—the pain in the head and eyeballs, the pains in the back and limbs, the gastro-intestinal pains and occasional diarrhœa, the rise of temperature, the general depression and *malaise;* and there is no reason why they should not be relieved. But the very ease with which this may be effected, is apt to mislead both the practitioner and the patient into the belief, that what is so easy and pleasant must always be best. This is particularly the case with regard to such drugs as salicin, the salicylates, antipyrin, antifebrin, exalgin, etc. A dose of salicin or sodium salicylate, with acetate of ammonia, in a diaphoretic draught, will often relieve the early symptoms of influenza and bring down the temperature like a charm; and antipyrin also will relieve the headache and the gastralgia when they exist. Our predecessors, in former epidemics, would have accomplished the same with Dover's powder, together with nitrous ether and acetate of ammonia; but not so completely or so quickly. And it is not against the occasional, but the continued and routine use of such drugs as salicin and antipyrin, that we would protest. Two or three doses may be permitted, but we must then turn our thoughts to the after-effects of influenza, to the influence of the influenza toxine on the heart and the cerebro-spinal nerve-centres. We believe that we should have seen much less of the prevailing cardiac asthenia, if more caution had been shown in the use of these mere pain-killing and temperature-depressing drugs. They are very effective and make a great impression on the patient, but they are two-edged swords, and they divert the practitioner from his most important duty—that is, to guard against "dangers *ahead*" and to give his patients suitable *tonics* from the first. There are those who speak of salicin as a tonic; we have had abundant reason to regard it, when taken freely, as a cardiac depressant. One of the most frequent symptoms observed during convalescence from influenza is profuse, exhausting perspirations. Salicin promotes this morbid action of the skin.

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* As the supposed characteristic bacilli are found in abundance in this bronchial secretion, antiseptic sprays and vapours for inhalation would seem a rational indication, and if adequately carried out might yield good results even in the cases referred to.

The remedy that is most deserving of confidence in the general treatment of influenza is **quinine.** We are disposed to believe it to be really an *anti-toxine* in this disease. We are quite aware of the difficulties that arise in giving it to some patients. We are ourselves unable to take it without suffering considerable discomfort. If the practitioner gives it unskilfully and incautiously, he will often be tempted to discard it as unsuitable. Had it not been so hastily and unwisely set aside, by many practitioners, we should have seen far less of cardiac asthenia and other troublesome sequelæ. The best and most efficacious way of giving it is in combination with citrate of potash and ammonia in effervescence, and in small or moderate, *not large*, doses, frequently repeated. From 1 to 3 grains dissolved in 10 to 20 grains of citric acid should be added to a mixture containing a sufficiency of ammonium carbonate and potassium bicarbonate to rather more than neutralise the citric acid. This dose should be given every three or four hours, and if there should be profuse sweatings in the afternoon or evening, a single additional dose of 5 grains of quinine dissolved in lemon-juice should be given at five in the afternoon. Given in this form, combined with an effervescing saline, it will be rarely found to disagree even with most sensitive patients. Many cases of influenza require *no* medicinal treatment whatever; but for those that do, we are satisfied there is no remedy so really beneficial and so calculated to save the patient from serious after-effects as quinine. We select the charts of two cases (Figs. 5, 6), on account of their severity, to show the course the cases took when treated with quinine.

Fig. 5 is the chart of a girl, sixteen years of age, who was admitted into King's College Hospital with a very severe form of influenza in January, 1892. She had extensive pleuro-pneumonia of both lungs, with severe pleuritic pain on the left side. She had a brown, dry tongue. She became actively delirious, and her temperature rose to close on 106°. Her highest pulse rate was 132, respiration 52. Her urine contained albumen. Her treatment was commenced with salicin in a mixture with sodium bicarbonate and ammonium acetate. Each dose, however, was rejected by vomiting. As her temperature was very high, as she was actively delirious, as her tongue was getting brown and dry, and as both lungs were attacked with pneumonia, we were anxious as to the issue of the case. We then ordered her one grain of hydrobromate of quinine and one grain of phenacetin, every hour, for eight doses, and instructed the house physician to summon us at the end of that time, if he were not satisfied with the effect of the remedy.

It answered admirably; the temperature began to fall, the delirium was quieted, and the tongue improved in appearance. She took the quinine and phenacetin hourly for three days, and she made a rapid and complete recovery. She had some ear trouble during convalescence, which was immediately relieved, by causing the mixed vapours of iodine and chloroform to pass into the ear from a cupping glass made hot, into which a few drops of chloroform and tincture of iodine were dropped, and held over the ear.

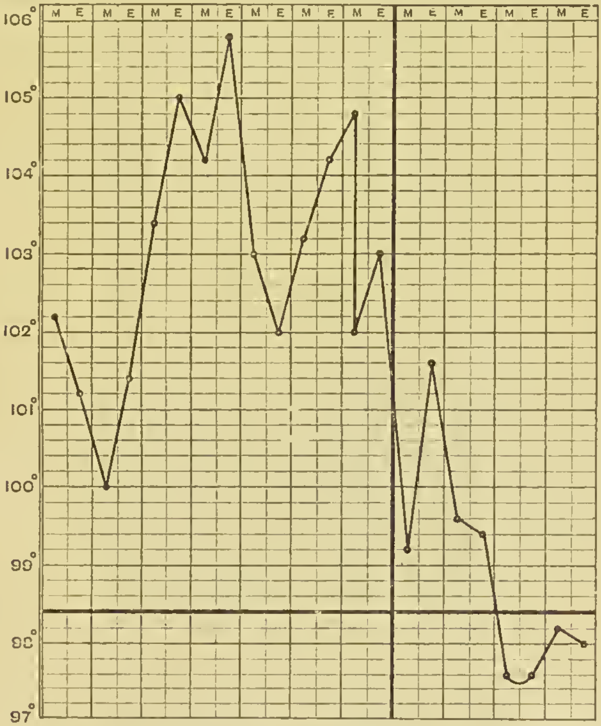

Fig. 5.—Chart of case of Influenza treated with Quinine.

The other case (Fig. 6) was one of a decided gastro-intestinal type—so much so that the house physician, having regard to the high temperature, the diarrhœa, and the abdominal pain, and the fact that cases of influenza were not at the time common, admitted it as a case of typhoid fever. Cases of this type have been cited as especially unsuited to treatment by quinine.

This patient was a night watchman, aged 27, and was admitted in February, 1893. He had been "out of sorts" for ten or eleven days, had felt chilly and drowsy, and had had pains in the head. For the last four days he had complained of loss of appetite, diarrhœa, and sickness, and had shivered at night.

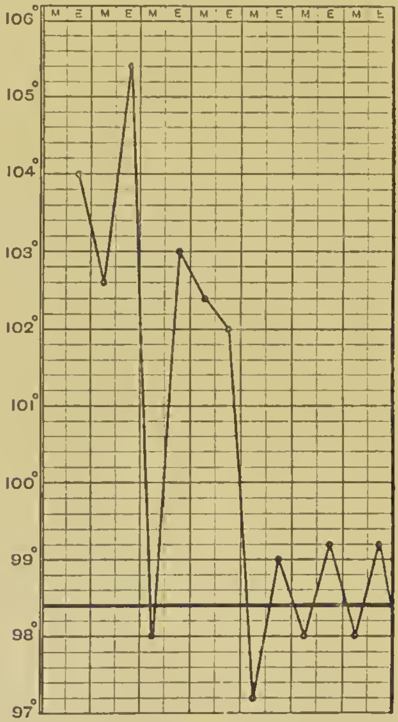

Fig. 6.—Chart of case of Influenza treated with Quinine.

There was a good deal of general tenderness over the abdomen on admission, with slight diarrhœa, and the motions were of a light colour. Highest pulse rate, 120; respiration, 42. His temperature the day after admission reached 105·4°. He was given the same mixture we are in the habit of prescribing for typhoid fever—that is, a mixture containing free chlorine, potassium chlorate, hydrochloric acid, and quinine (2-grain doses) every three hours. The effect was most remarkable. In a few hours the temperature had descended below normal, and in four days he was convalescent, although he was kept in the hospital a fortnight longer by way of precaution.

We have selected these two cases for the purpose of showing how advantageously quinine acts in the severest forms of febrile influenza. In the first case phenacetin in small (1-grain) doses was associated with the quinine, and must be given part of the credit of the quick and good recovery. But we have seen abundant reason for believing, that those patients who were treated adequately and early with quinine, escaped the troublesome after-effects of this disease to an extent more than can be claimed for any other remedy. Common as cardiac feebleness was as an after-effect of influenza, we treated an elderly patient, who had long suffered from a weak, dilated heart, through a sharp attack of this disease, with the quinine treatment we have described without his suffering the slightest aggravation of his cardiac debility. With regard to the *preventive* influence of quinine, we have been furnished with abundance of facts, from a variety of observers, in support of the belief that, in some constitutions at any rate, it does exert a prophylactic power; but it does not do so with all. One practitioner thought quinine, as a snuff, proved protective.

We place these remarks on the action of quinine foremost in what we have to say of the treatment of influenza, because we are convinced, that practitioners have unwisely allowed themselves to be diverted from the study of this old and tried remedy for infectious fevers, to the use of other newer drugs of far less real value, which, although remarkable for their pain-relieving and temperature-reducing properties, possess remote toxic effects that are not fully understood or sufficiently appreciated.

We have said there are many cases of influenza that require **no medicinal** treatment—cases with a moderate amount of pain in the head, back and limbs, often some patches of cutaneous hyperæsthesia, chilliness, and a moderate rise of temperature, some coryza and laryngeal catarrh, and general depression. Rest in bed, warmth, light fluid, but nourishing, food, some stimulant, of which good port wine and champagne are the best; home-made lemonade for the feverish thirst, and oranges in abundance, are all many such patients need. A gentle aperient, such as effervescing citrate of magnesia, or sulphate of soda, if the bowels are confined; if there is restlessness, from pain and aching of the limbs, 10 grains of Dover's powder and 10 grains of salicin, with ½ an ounce of acetate of ammonia and an ounce of camphor water, in a draught at bed-time for a night or two, is comforting and soothing, and is useful to nervous persons. We believe that this is all that is needed in by far the great majority of cases; but such patients would be wise to take moderate doses of quinine for a week or ten days after the feverish attack has passed away, in the manner we have already indicated.

But there are certain symptoms that require special consideration. An early and sustained high temperature, especially if associated with a tendency to delirium, points either to the absorption of a large amount of the special toxine, or to a peculiar sensitiveness of the organism to the infective agent, or to both. The **indication** is to eliminate the toxine or to neutralise its effect by an anti-toxine.

It is remarkable how few experimental observations have been made in this direction. It is true that Pfeiffer, Katasato, Klein, and others, have described a somewhat characteristic bacillus as present in the mucus of the air-passages; and others profess to have found it also in the blood; and there would seem to be a strong probability that influenza is a bacillary disease, propagated and diffused by a specific micro-organism, and that there *are* means of neutralising its morbid activities in the human body. It would seem probable also that the specific organism, like that of cholera and diphtheria, gives rise to an "intoxication," not to a "septicæmia"; that its toxine is produced on the surface it attacks and is subsequently absorbed into the blood.

This being the case, efforts to neutralise and antagonise the activities of the infective agent, in the mouth and air-passages, by means of **antiseptic** vapours, sprays, and lotions are rational and proper. We have seen cases in which a *secondary* infection, after the cessation of the general attack, has appeared to originate in the mouth, affect the salivary glands, extend to the middle ear, and finally involve the brain, which might probably have been prevented by the early, and continued, and adequate use of disinfecting inhalations and mouth-washes.

These applications, if they are to be adequate, give, we are aware, a great deal of trouble, and in very many cases they may not be needed; but they probably save a life here and there, and they may be very influential in preventing the spread of the disease.

We have already given our reasons for thinking that quinine acts as an anti-toxine in this disease; and although we really know very little about phenacetin, it would seem, from clinical observation alone, to be a very valuable addition in small doses to quinine, in cases with high temperature and delirium.

If the headache or the gastro-intestinal pain is great, one or two (not more) small doses (5 grains) of antipyrin may be given for its relief.

Salicin and the salicylates will relieve the muscular pains and cause diaphoresis; they are useful *only* for this purpose, and they should be set aside immediately the pains are relieved. There is not the faintest shadow of a foundation for the assertion that salicin is a specific remedy for influenza. Very much harm has been caused by the attempt to diffuse such a belief amongst the public.

One of the most troublesome and lingering symptoms, in the slighter attacks, is a hard, distressing laryngo-tracheal cough, with scanty tenacious expectoration. Ordinary sedative, opiate cough syrups and lozenges often aggravate it, by still further thickening the mucous secretion. The best remedies for this cough are inhalations of saline sprays and antiseptic vapours, the ammonium chloride lozenges (or inhalations), and, best of all, change for a few days to the seaside.

The bronchitis and broncho-pneumonia which complicate many cases of influenza, especially in the aged and feeble, are, as we have already pointed out, most troublesome to treat, and are often fatal.

The general principles which govern the treatment of these affections, and which we have fully considered in former chapters, apply here also ; but in influenza we especially require a remedy which shall *thin* the *tenacious bronchial secretion*, so that the patient shall be enabled to expectorate it and clear his air-passages. With this object warm, stimulating alkaline drinks should be given freely. Hot milk, with an equal quantity of Apollinaris or seltzer water, in cupfuls frequently, with two or three teaspoonfuls of whisky or brandy in each, will often answer well as an expectorant. Ammonium chloride with ammonia carbonate—10 grains of the former and 5 grains of the latter—with 5 to 10 grains of sodium bicarbonate, half a drachm of tincture of senega, and 1 ounce of chloroform water, and sometimes a few drops of ipecacuanha wine, will be found also an excellent expectorant, and the addition of a tablespoonful or two of hot water to each dose will often promote its action. Inhalations of hot alkaline sprays, to which a little glycerine of carbolic acid is added, will be found to answer well in children, and may be tried also in adults and old people. Mustard poultices are very useful to relieve the patchy pulmonary congestion that often accompanies influenzal bronchitis, and the free use of turpentine liniments is especially useful. Active stimulation will be needed in most of these cases.

In the fairly vigorous such measures as these will be attended with good results; but in the old and feeble all our efforts will often prove in vain, and their air-passages will become obstructed by mucus they cannot expel.

Gastro-intestinal catarrh may require, after an initial aperient, a few doses of bismuth and sodium bicarbonate, and occasionally one or two small doses of calomel will act well. Vomiting will be checked by small doses of morphine and hydrocyanic acid.

Cases of a **cerebro-spinal** type, with very severe cephalic pain, delirium, and ocular and auditory disturbances, may require bromides and opiates. Aural catarrh and otalgia are best relieved by the vapour of chloroform diffused into the ear from a hot glass or cup, into which 10 to 20 drops of chloroform are poured from time to time. The addition of a few drops of tincture of iodine to the chloroform, and painting behind the ear with iodine, are also useful.

The nervous and muscular exhaustion that follow most of the severe, and also many apparently slight attacks, require prolonged rest, and change, and suitable tonics. Strychnine, coca, arseniate of iron, and valerianate of quinine are among the best. Most practitioners have found that a very free allowance of wine, chiefly sound port and champagne, is needed during convalescence from this disease. The **cardiac asthenia** which often appears both during, and after, influenzal attacks, requires careful treatment. We have called attention to some remarkable cases of post-influenzal cardiac asthenia elsewhere.* Such cases require very prolonged rest, as well as the judicious use of the tonics we have just named. We think strychnine the best, and we often combine iron and quinine with it. Arsenic may be given to patients who cannot take quinine well, and the arseniate of strychnine is a convenient form. In some instances we have had to give full doses of digitalis with large doses of iron and quinine. Phosphorus, phosphide of zinc, and the hypophosphites have been found useful. In the serious syncopal forms hypodermic injections of caffeine, of strychnine, and of ether have been needed.

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* "Clinical Society's Transactions," vol. xxv. p. 185.

The foregoing remarks reflect our own personal experience chiefly.

Other measures and remedies have been recommended, and some of them certainly merit consideration.

The *inhalation of antiseptic vapours* has been observed by many to be protective against infection, as well as remedial in the attacks. Eucalyptus oil, for this purpose, has had many advocates ; a saturated solution of camphor in terebene has been spoken well of ; a liniment composed of equal parts of oil of eucalyptus and chloroform liniment, rubbed warm over the chest, has been found of much service.

Perhaps the most popular remedies have been potassium bicarbonate, antipyrin, phenacetin, quinine, salicin, sodium salicylate, ammonium salicylate, salicylate of quinine, acetate of ammonia, and the ordinary diaphoretics. Formulæ for these and other suggested remedies will be found at the end of the chapter. Isolation from other members of the family is to be recommended, with the view of checking the spread of the disease, which, according to the judgment of Sir George Buchanan, "is, in its epidemic form, an eminently infectious complaint, communicable in the ordinary personal relations of individuals one with another."

THE TREATMENT OF MALARIAL FEVERS.

We term "malarial" fevers those febrile states which arise in persons who are or have been exposed to "malarial" infection. This "*bad air*" or *malaria* is an emanation from the soil in certain regions,* which are on that account termed *malarious.* The *infection*, which appears to be telluric and contained in the soil under certain conditions, becomes diffused into and infects the stratum of air immediately overlying it, and so, in certain circumstances, human beings who are exposed to this air become infected. The infection may be carried by winds and currents of air to some distance from its place of origin, so that at times it spreads far beyond its usual limits, and assumes almost the character of an epidemic. It was at one time thought that *malaria* only occurred in wet, marshy districts, and that surface moisture and decaying vegetable matter were essential to its production. It is now known that such is not the case; and although marshy districts are often apt to be malarious, yet some of the most pernicious forms of malarial fever have been acquired in dry, barren, and even elevated districts. In intertropical regions it is exceedingly common and continuously present, and in those countries, heat and moisture, and a luxurious vegetation, usually co-exist with the presence of malaria. "Nothing is so deadly as breaking up the virgin soil in the tropics"; and it is well known that excavations, or any disturbance of the soil of places that are or have been malarious, is almost certain to be attended with an outbreak of malarial disease, often of a grave form.

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* For the sake of brevity we only state such facts, *without discussion*, as are now generally accepted. The subject is fully examined by Osler, "Practice of Medicine," p. 140 ; and by Prof. Duck in Hare's "System of Practical Therapeutics," vol. ii. p. 329.

It is unnecessary here to enlarge on this part of the subject, or to describe the regions that are known to be malarious—they abound in some of the British possessions in India, in Africa, in the Southern States of America, and in many parts of Europe, notoriously in the Roman Campagna and the Pontine marshes, in Italy. In England malaria is chiefly limited to a few districts—the fen country and some of the Kent and Essex marshes—and grave forms are rarely seen.

We have said that the exciting cause of the disease is a telluric infection, that the infective agent is contained in the soil of malarious regions; we must add that it appears to be undoubtedly *microbic.* Klebs and Crudeli's *bacillus malariæ* is not, however, believed to be the organism involved; but the organism first found in the blood of malarial cases by Laveran, and named by Marchiafava and Celli *plasmodium malariæ*, appears, from recent researches, in which Osler, Duck, and other American investigators have taken part, to be the real agent in the causation of malarious affections. This organism is, however, only known in the human blood. It has not as yet been found outside the body in any form, nor is it known how it gains access to the human body, nor how it leaves it; but probably it enters through the respiratory organs most commonly, and occasionally in water used for drinking. It is an animal organism belonging to the Protozoa and to the group of *hæmatozoa*, and it appears to be a parasite of the red blood corpuscles. This organism appears to assume different phases of growth * in the different varieties of malarial fever. We must content ourselves here with stating that there is an *amœboid* form which displays active movements within the red corpuscles, and that it undergoes a process of *segmentation* corresponding to the ague paroxysms. The *larger* forms are found associated with the typical intermittents. The remittent and pernicious forms are associated with a "small plasmodium."

"The general symptoms and morbid anatomy of malaria are in harmony with the changes which this parasite induces. The destruction of the red blood corpuscles by it can be traced in all stages. The presence of the pigment in the blood and the viscera, so characteristic of malaria, results from the transformation of the hæmoglobin by the plasmodia. The anæmia is a direct consequence of the widespread destruction of the corpuscles by the parasites" (*Osler*). Moreover, they disappear, together with the symptoms, on the administration of quinine.

There are four principal clinical forms of malarial affections:—(1) The *typical intermittent* fever or *ague;* (2) the *remittent* or *atypical* form; (3) the *pernicious* form; and (4) the *malarial cachexia.* A very brief account of these different forms must suffice for our present purpose.

(1) The typical intermittent form is the form we

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* See Osler's "Practice of Medicine," p. 143.

most frequently meet with in Great Britain. Its characteristic features are well known. First, a *cold stage*, generally ushered in by headache, lassitude, nausea, and vomiting. Although in the axilla or rectum the thermometer shows a rise of temperature which may reach 105° to 106°, the surface of the body is cold, and the patient looks pale and cold and shivers, and his teeth chatter. This stage lasts from a quarter of an hour to an hour or longer, and is gradually succeeded by (secondly) the *hot stage*, when the surface becomes very hot and red, the face flushed, and the pulse, which had been small, hard and quick, becomes full and bounding, and the head throbs and aches. The temperature remains high, and there is intense thirst. This stage lasts three or four hours, and is followed by (thirdly) the *sweating stage*. A copious perspiration breaks out over the whole body, and this is attended with great relief; the headache disappears, the temperature falls rapidly, the paroxysm passes off, and the patient usually falls into a refreshing sleep. The whole paroxysm usually lasts from twelve to fifteen hours, but it may vary considerably, and the cold stage is sometimes absent. The spleen is usually found to be enlarged during the paroxysms. During the interval between the paroxysms the patient feels well. The great characteristic of this disease is the regularity with which the paroxysms return—their periodicity. If the paroxysm returns at the end of twenty-four hours, the type is *quotidian;* if at the end of forty-eight hours, it is *tertian;* if at the end of seventy-two hours, it is *quartan*—this last is a rare form. Golgi has observed in the tertian type that the blood corpuscles contain small amœboid bodies which develop gradually, become deeply pigmented, and (just prior to and during the chill) undergo *segmentation* into fifteen to twenty separate bodies, aggregated around the central mass of pigment.

If left untreated, this disease may disappear after a time spontaneously; but it is then liable to recur, and persistence of the fever leads to anæmia and hæmatogenous jaundice from destruction of the red corpuscles by the parasites.

(2) The *remittent* malarial fever is especially seen in tropical countries; it is sometimes termed *bilious remittent* fever and, in India, *jungle* fever. In this form there are no complete intermissions, but only *remissions*, or intervals in which the fever is more or less subdued. The cold stage is less marked, and the third or sweating stage may be absent. The remissions may last twelve hours or longer. The temperature remains constantly above normal, but falls two or three degrees during the remissions, and paroxysms with or without chills may occur, in which the temperature may rise up to 105° or 106°. Some cases have a great resemblance to typhoid, and the best diagnostic distinction is to be derived from an examination of the blood for the *plasmodium malariæ.* Vomiting, with epigastric uneasiness, is a marked symptom. Jaundice is not uncommon, and severe headache is usually constant, and occasionally delirium occurs. This form varies greatly in its course and severity.

(3) The *pernicious* form. This is usually a rapidly fatal form. A *comatose* form has been described in which either acute delirium or coma develops rapidly, with high fever and hot and dry skin; also an *asthenic* or *algid* form is described in which there is intense prostration, with sub-normal temperature, vomiting, suppression of urine, and frequently death from profound asthenia; and a *hæmorrhagic* form is also known and is often spoken of as malarial *hæmaturia*, in which the blood destruction is rapid and the urine contains both hæmoglobin and blood corpuscles. These cases are apt to prove rapidly fatal. The pernicious forms are often seen in the tropics; and some Italian physicians describe them as of frequent occurrence during severe malarial outbreaks in Italy.

(4) Finally, there is what is known as *malarial cachexia.* This is generally the result of repeated attacks of ague, although it is also said to occur in

persons who have lived long in a malarious region without having actually suffered from fever. It is characterised by great *anæmia*, an *enlarged spleen*, and an irregular sub-febrile state, the temperature varying between 99° and 103° F. The symptoms are those due to the profound anæmia and to the sub-febrile state.

We have taken this brief but general survey of the ground covered by malarial infection, in order that we may enter, more profitably, upon the consideration of the treatment of these morbid states. The subject is one of the greatest therapeutic interest and importance. The discovery of a specific cure for **ague** was rightly regarded as calculated to lead to other similar discoveries for the cure of other related maladies. If this expectation has not hitherto been realised, it does not follow that it never will be. The modern discovery of the dependence of specific infective disease on the agency of specific microbes, should prompt investigators to a closer examination of the mode of action of quinine, in the cure of this most characteristic disease, and we are glad to note that the recent discovery of a specific organism in the blood in malaria has led to the resumption of such inquiries.

Professor Duck, referring to the well-known observations of Binz on the action of quinine on protoplasm, and to the fact that even weak solutions exert an injurious and even fatal effect on certain organisms, argues in favour of the conclusion that the *plasmodium malariæ* is similarly affected by this drug. He points out that 5 grains of quinine, circulating in the blood of a man of average size, represents a dilution of about 1 in 16,000, a stronger solution than that with which Binz obtained some of his poisonous effects; and he also points out that the medium to be poisoned is not the whole body, but only the blood mass in which the parasites are active. It follows that a *large* quantity of quinine is not needed to produce its toxic effect on the invading parasite. "All that is required is a solution of sufficient strength to inhibit the growth of the organisms, when they will become the prey of the phagocytes." It is thus that quinine comes, as it were, to the aid of the natural physiological protective function of the phagocytes in the blood.

We have always protested against the administration of large toxic doses of quinine, much of which, when given in the solid form, probably passes out of the body unabsorbed. It has, however, been shown that the parasites vary greatly, according to their various stages of development, in their resistance to quinine, and that the phase in which they are most sensitive is the amœboid one, which occurs clinically *between the paroxysms.* "If quinine be given in this period in a case of simple type, the development of the parasites will be checked and the individual, for the time being, cured. If the parasites are present in widely different stages, as occurs in cases of irregular or mixed type, another paroxysm will follow unless the effect of the drug be continued."* The latent germs must be destroyed by a sort of continuous sterilisation.

Quinine does not render the blood immune from further infection; it only acts as a direct poison to the infective agent when present. Of the various salts of quinine that have been proposed for use in this disease, the *sulphate* justly maintains its wide popularity. The *hydrochlorate*, the only other salt admitted into the B.P., has the advantage of greater solubility and higher alkaloidal strength (hydrochlorate = 81·71 per cent., sulphate 74·31 per cent.), but it is somewhat dearer.

We have already said that very large doses are not needed in ordinary cases. Much, we think, depends upon its mode of administration, and we have seen reason for believing that much smaller doses are needed when it is given dissolved in citric acid and combined with a saline effervescent. It should also, of course, be given, if practicable, when the stomach is empty. Ten to 15 grains will usually check an ordinary paroxysm of ague. It should be given in 3- to 5-grain doses every two or three hours, until the whole quantity has been taken. Even in the most severe cases it is not necessary to give more than 40 grains in the 24 hours. Larger doses are not only unnecessary, they are injurious. Effervescing drinks should be given at the same time. The giving of quinine in pills or tabloids should be avoided, as they often escape solution and absorption, and it should always be given dissolved in acidulated water. If there is very great objection to its bitter taste, it may be administered in a cachet mixed with an equal quantity of powdered sugar and citric acid, and washed down with a wineglassful of lemonade.

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* See the excellent article on "Malarial Diseases" by Professor Duck, of Michigan, in Hare's "System of Practical Therapeutics," vol. i. p. 328.

The following is a convenient formula for its use in these cases :—

℞ Quininæ sulphatis	80 grains.
Acid. sulph. aromat.	2 drachms.
Syrupi aurantii	1½ oz.
Aquæ cinnam.	ad 4 oz.

M. f. mist. One to four teaspoonfuls for a dose, in two to four tablespoonfuls of water.

A teaspoonful of this contains 2½ grains of quinine, so that the dose is easily calculated.

Quinine is sometimes given *by the rectum* when there is difficulty in getting it taken by the mouth, or when, on account of obstinate vomiting, it cannot be retained in the stomach. The rectum must be first washed out with tepid water, and 10 to 20 grains of hydrochlorate of quinine should be dissolved in just sufficient dilute hydrochloric acid to keep it in solution, and then mixed with 2 or 3 ounces of thin starch, and a few drops of laudanum, and injected with a long tube as high as possible. If care is not taken tenesmus will be provoked and a part of the enema of quinine will be rejected.

Hypodermic injection offers a very serviceable method of quickly introducing quinine into the system, and is especially applicable to the *pernicious* forms when the patient may be unconscious and unable to swallow. A certain amount of pain attends the introduction of a solution of quinine in this way, but no other risks are incurred, if strict aseptic conditions be observed.

The following formula has been recommended for this purpose :—

℞	Quininæ hydrochlor.	20 grains.
	Acid. hydrochlor. dil.	5 minims.
	Aquæ destill.	15 ,,

M. This fills an ordinary hypodermic syringe, and is a full dose of 20 grains.

We should probably avoid much of the pain that this concentrated solution causes by using a syringe that would hold half-an-ounce, and diluting this solution to that extent, and then injecting very slowly and deeply in two or three situations.

As, however, the solution for this purpose may have to be made in haste, Professor Duck uses the sulphate in the proportion of 10 grains to a dram of distilled water, and adds dilute sulphuric acid, drop by drop, until the quinine is dissolved; so that an ordinary hypodermic syringe of 20 minims will contain rather more than 3 grains. He makes the injection into the buttock, but the lumbar region, or between the scapulæ, or the hypochondriac regions, are all suitable. It is best to inject in two or three places, and as deeply as possible. "The small tumour formed by the fluid should be dispersed by gentle pressure." The water used should be sterilised by boiling, and we should see that the needles and syringe are completely aseptic. Duck has not found the effect of hypodermic injections of quinine more marked than when quinine is given by the mouth, and we are able to corroborate this observation from our own experience.

Intravenous injection of quinine has been advocated by Baccelli in pernicious forms when other channels of absorption cannot be relied on. Acid solutions cannot be used for this purpose, so he employs the following :—

℞ Quininæ hydrochlor.	15 grains.
Sodii chloridi...	12 ,,
Aquæ destill.	2½ drachms.

This solution is boiled and filtered before using, and when warm is quite clear.

A bandage is applied above the elbow, so as to distend the veins of the fore-arm. A small vein, usually in the middle of the inner side of the fore-arm, is selected, and the needle of the hypodermic syringe is introduced from below upward. The syringe is made to hold 75 minims (7½ grains of quinine), and it and the needle are of course rendered perfectly aseptic before use. The bandage is removed from the upper arm and the fluid then slowly injected into the vein. The occurrence of a small tumour at the seat of puncture would indicate that the needle had missed the vein. The punctured wound is covered with collodion. The symptoms of quinine intoxication soon appear, but do not last more than 15 or 20 minutes. Baccelli, with 15-grain doses, had brilliant results even in several cases of pernicious type. He reported 30 cases of this type so treated without a death,* whereas he had 5 deaths in 16 cases treated by the hypodermic method.

Quinine should not be given during the paroxysm, but during its decline, or at its end and in the intervals; three or four 5-grain doses may be given at intervals of two hours, commencing as the temperature falls, or, if more convenient, soon after the end of the fit. This will usually either prevent the next paroxysm or greatly reduce its intensity. Should there be a slight rise of temperature at the time the next paroxysm is due, two 5-grain doses of quinine should be given. Then the quinine should be withheld for four days (supposing, of course, there is no return of the fever); but on the seventh day after the last attack four doses of 5 grains each should be given, and the same on the fifteenth and twenty-second days. In cases of moderate intensity this will usually be sufficient to cure the disease. If the patient is obliged to continue to live in a malarious district he had better continue to take small doses of quinine daily. A writer * who has had much experience of fever in Africa says: "All ideas about not being able to stand quinine, that 'it flies to the head' and so forth, must be banished as utter nonsense. In Africa everyone can stand quinine." Neurotic persons prone to be made delirious by this drug should be given small doses at short intervals, and they should be stopped as soon as signs of intoxication appear. A full dose of potassium bromide, 40 to 50 grains, may be given should such nervous disturbances become manifest.

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* International Congress in Berlin, 1890.

The only other cinchona alkaloid that can be, with certainty, substituted for quinine is cinchonidine.

Of the value of arsenic as a substitute for quinine some difference of opinion exists. Duck thinks its utility is confined to the treatment of malarial anæmia, and that it is uncertain, even in large doses (and then, of course, dangerous), in the treatment of the paroxysm. Tomassi-Crudeli thinks it of great service as a prophylactic to persons who have to live in malarial districts.

But the treatment of malarial fever is not limited to the administration of quinine. In an ordinary attack of ague, at the first onset of the symptoms, such as pain in the back and limbs, yawning, nausea, vomiting, etc., the patient should go to bed and avoid taking anything into his stomach, either food or drink, as it will only provoke vomiting. During the chill he should be warmly covered, and hot-water bottles applied to the feet and back. Attempts to stop the chill by amyl nitrite, or to abort the attacks by pilocarpine, seem to be of doubtful utility. Some give a full dose of morphine to abort the chill if the case is seen early. No doubt this is an expedient which

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* "Health Hints for Central Africa," by Horace Waller, M.D. Murray, London.

greatly lessens the patient's sufferings. Tepid water may be given to render the vomiting easier and to wash out the stomach, if this symptom is troublesome; if it persists, some effervescing alkaline drink should be given and a mustard plaster applied to the epigastrium; and if very severe, a dose of morphine may be given hypodermically. Symptoms of collapse in the cold stage, which may appear in old or feeble and cachectic persons, must be encountered with ether and ammonia mixture and hot coffee with a little brandy.

In the hot stage lighter coverings may be substituted and the thirst relieved by fragments of ice, and the surface may be sponged over with tepid water to which a little eau-de-cologne has been added. Cold applications to the head will relieve the throbbing headache. Small doses of morphine ($\frac{1}{12}$ to $\frac{1}{24}$ grain), with acetate of ammonia, every four hours, are recommended by Duck to relieve the unpleasant symptoms of the hot stage. Antipyrin has been given to relieve the headache, but its depressing action has often been found injurious. Large mustard plasters are of great use to relieve epigastric pain and congestion of the liver and spleen. During the sweating stage the patient may be allowed to drink freely of water or effervescing drinks, as lemonade, or cold tea, etc., and the surface of the body may be rubbed with warm cloths. At this stage the specific quinine treatment should be begun in the manner we have indicated. As soon as the temperature has fallen to normal the patient may be permitted to get up and dress and go about.

It is not always necessary, but it is often advisable, to give a purgative when the quinine treatment is begun. In tropical countries this is almost always the rule, and when there exists constipation, with a coated tongue and muddy skin, it is always advantageous. Calomel is usually the best purgative in these cases, and 2 or 3 grains combined with 5 or 6 grains of colocynth and henbane pill, and followed by a seidlitz powder or a dose of Carlsbad salts, will act, as a rule, very efficiently. Some combine calomel with quinine when it seems desirable to speedily get the action of both. Purgatives must not, however, be given as a mere matter of routine, as they may be injurious to the debilitated and to those suffering from chronic intestinal catarrh.

The appropriate **after-treatment** of these cases consists in giving blood restoratives and tonics, and a generous diet, with a moderate amount of stimulants, such as sound wine or beer. Cold or tepid baths, with frictions and exercise in the best air that is attainable, should be also advised. Small or moderate tonic doses of quinine, with mineral acids, should be given daily; and in very anæmic cases a pill of arseniate of iron ($\frac{1}{8}$ to $\frac{1}{4}$ grain) should also be taken three times a day after meals. The bowels should at the same time be kept open by gentle aperients. We should be on our guard against relapses, and on any rise of temperature we should return at once to the quinine treatment.

In the **remittent** form the treatment should be conducted on precisely the same principles as in the typical intermittent form. The period of the remission must be seized upon for the administration of quinine, and as vomiting and gastric irritability are almost always present in these forms, it may be best to give it hypodermically. It is especially in these cases that comparatively small doses of quinine (2 to 3 grains) dissolved in citric acid and given every two or three hours in combination with an effervescing saline, as we have repeatedly advocated in this work, answers so well, and will often be retained even when the stomach has manifested great irritability to other medicines. Constipation, if it exists, must be overcome. Repeated small doses of calomel and ipecacuanha have been recommended for this purpose. To avoid delay and ensure an action of the bowels, enemata of soap and water containing a spoonful or two of castor oil, should be given when necessary.

To relieve the headache, delirium, and other nervous symptoms the administration of morphine with atropine has been advised; but there is this great drawback to the use of morphine, that it tends to further embarrass the action of the liver, and it favours constipation. We should prefer to give full doses of bromide by the rectum, with chloral if needful. If we find large doses of quinine are absolutely required we must give them hypodermically—10 to 15 grains every hour or two—and their effect must be maintained by continuing to give 20 to 40 grains daily. The disease, as a rule, will soon yield to this method of treatment. The patient's strength must be maintained by suitable food and stimulants, and we shall often for this purpose be obliged to have recourse to rectal feeding.

In the **pernicious** form we must not wait for remissions or intermissions, but quinine must be given in full doses, as already described, either hypodermically or by intravenous injection. We must make efforts to keep up the patient's strength by rectal injections of beef-tea and brandy, peptonised milk, tea, coffee, etc. Frequent hypodermic injections of strychnine may be needed ($\frac{1}{30}$ to $\frac{1}{20}$ grain every hour or two). Morphine with atropine must be given to allay restlessness. Ether, camphorated oil, and caffeine may also be used, as cardiac stimulants, hypodermically. If there has been *hæmaturia* during the attack, on recovery, in addition to quinine, perchloride of iron with arsenic will be needed for the relief of the extreme anæmia that is likely to follow. The addition of strychnine has also been strongly advocated by American physicians.

Malarial cachexia, characterised by profound anæmia and an enlarged spleen, and attended by symptoms of gastro-intestinal catarrh and hepatic congestion, needs to be treated on general principles. Iron, arsenic, strychnine, nitro-hydrochloric acid, bismuth, ammonium chloride, nitrate of silver, ipecacuanha, podophyllin, calomel, bichloride of mercury, and many other drugs, have been advocated for this condition, and all or any of them may prove suitable to individual cases. But change of climate, dietetic cures, and mineral water cures are, perhaps, more successful than any other treatment for these patients. Hydrotherapy and massage have been found very useful in the treatment of the local congestions common to this state. Bracing seaside resorts and sub-alpine mountain resorts, among attractive scenery and with scope for pleasant excursions, where blood regeneration can be favoured by a life spent much in the open air, are best suited to those cases.

For the gastro-intestinal and hepatic troubles the following spas are suitable, the selection depending on the nature of the individual case and constitution:—Vichy, Homburg, Kissingen, Carlsbad, Marienbad, Tarasp, Pyrmont, and others.

THE TREATMENT OF TETANUS.

The discovery of the **tetanus bacillus** by Nicolaier has thrown a flood of light on this hitherto mysterious and fearfully fatal malady. The fact that the symptoms of this disease were prone to make their appearance after the reception of wounds or injuries, or even *slight abrasions of the skin* occurring in a variety of circumstances, was suggestive of the belief that it was caused by the entrance into the body of some infective agent from without. Tetanus is now demonstrated to be an infective disease due to the introduction of a micro-organism into the tissues, where the bacillus multiplies and produces *toxines* which poison the spinal cord and cause intense exaggeration of its reflex excitability. Idiopathic forms have been reported to occur, from exposure to cold, or from sleeping on damp ground. In such cases it may be concluded that the specific microbe gains an entrance to the body by one of the natural orifices. Its observed endemic occurrence, at times, was also highly suggestive of an infectious origin. The specific bacillus has been isolated and cultivated. It is a slender rod with rounded ends ("drumstick-shaped"), and grows into long threads. The products of its culture injected into animals excite symptoms of tetanus. Brieger has separated from these cultures poisonous substances capable of producing the disease. One of these ptomaines, which produces symptoms of tetanus, has been named tetanin. Another important fact, bearing on the therapeutics of the disease, is that animals may be protected against tetanus by inoculation with the blood serum of another that has had the disease. The specific microbe has been found in surface soil and in putrefying fluids, and this will account for the fact that the antiseptic treatment of wounds, on the battle-field, has been found to protect largely from subsequent attacks of tetanus. A form attacking new-born children and parturient women—the poison entering the body in these instances doubtless through the umbilicus in the one case and the generative passages in the other—has often been very prevalent in hot countries, especially amongst the negroes of the West Indian Islands. In these cases also, there can be little doubt that the strict application of antiseptic principles, in dealing with parturient women and new-born children, would prove preventive of the disease.

We have not space to enter into a detailed description of the symptoms of this disease. The most characteristic are tonic spasms of the muscles, usually beginning in those of the face and neck. Sustained spasmodic contraction of the muscles of the jaws leads to trismus or *locked jaw.* The spasms extend to the other muscles of the body, especially those of the back; the patient is thrown into a state of opisthotonos, the back is arched, and the body rests on the head and heels. Various other forms of spasmodic contraction occur. The spasms are more or less paroxysmal, and the slightest irritation is sufficient to bring on the paroxysms, and the more violent ones are attended with agonising pain. Death often occurs in a few days.

With regard to **treatment,** there can be no doubt that the thorough application of aseptic methods in the dressing of wounds, however trivial, and in the performance of operations, is an important preventive measure. Da Costa justly remarks: "Perfect asepsis in surgical procedures means freedom from tetanus as surely as it means freedom from septicæmia." If tetanus actually exists and a wound is found, this must be rendered, by approved surgical methods, as completely aseptic as possible.

Owing to the extreme excitability of the nervous system, the patient must be isolated in a darkened room and kept absolutely quiet. Concentrated fluid food and stimulants must be freely given. When, owing to spasm, there is difficulty in giving food, a stomach-tube with funnel must be passed along the floor of the nose, through the pharynx, into the stomach, and the patient fed in this way. It may be necessary, as has been suggested, to give chloroform twice or thrice daily to permit of this being done. Brandy or whisky, from 4 to 16 ounces daily, should be given; it acts as a sedative to the nervous system and promotes muscular relaxation. The bowels may be relieved by enemata once daily, and the possibility of the occurrence of retention of urine must be borne in mind. Of drugs, the most efficient is a combination of chloral and potassium bromide in very large doses. Chloral has been given hypodermically, and by intravenous injection, with success in some very severe cases. These drugs may also be given by the nose tube or per rectum. A drachm of potassium or sodium bromide, with 20 grains of chloral, may be given every two or three hours. Chloral may act curatively by its antiseptic as well as by its sedative properties. Inhalations of chloroform prove of great service in allaying the paroxysms, and when these are attended with great suffering it may be necessary to keep the patient almost continuously under its influence. The injection of atropine into the tetanised muscles proves a useful adjunct to the chloral and bromide treatment. Inhalations of *nitrite of amyl* and hypodermic injections of nitro-glycerine have also been found of service. An ice-bag to the spine is a valuable expedient. *Opium* and *morphine* are of undoubted value in this disease. They should be given freely, and are usually well borne. A plan of injecting morphine deeply into the affected muscles has been of great service, and under this treatment the masseters have relaxed and food has been taken.

Many other drugs have been used in the treatment of tetanus and curative virtues claimed for them, such as aconite, conium, cocaine, curare, cannabis indica, physostigma, gelsemium, tobacco, duboisine, hyoscyamin, etc.

It seems possible that if quinine were administered early by intravenous injection, or subcutaneously, as in malarial fevers, a curative influence might be discovered. This method should be tested, together with sedatives.

Recently the treatment of many cases of tetanus by tetanus *antitoxine* has been adopted, and successful results have been published. This substance has been obtained from the blood serum of immunised animals after a method devised by Tizzoni and Cattani. It can hardly be said that any very conclusive results as to the value of this method have as yet been established, but it is a therapeutic experiment which will be watched with the greatest interest, not only from its possible importance with regard to tetanus, but also from its wide-reaching influence on the therapeutics of infective diseases generally.

Carbolic acid[*] has been injected subcutaneously as a parasiticide by Bacelli and others in cases of tetanus, and with good results; and Pirrani has combined subcutaneous injections of carbolic acid with antifebrin internally, and this treatment has been followed by recovery.

ADDITIONAL FORMULÆ.

For influenza—febrile form.

℞ Quininæ sulph., 30 grains.
Extr. cinchonæ, 30 grains.
Extr. aconiti rad., 1½ grain.
M. et divide in pil. 20. One three times a day.
(*Huchard.*)

For influenza with pulmonary catarrh and inflammation.

℞ Pulv. ipecac. comp., 30 grs.
Pulv. scillæ, 30 grains.
Quininæ sulph., 30 grains.
M. et divide in pulv. 20. Four to five daily. (*Huchard.*)

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[*] "Year-Book of Treatment," 1892, p. 111.

For gastric pain and vomiting in influenza.

℞ Sodii bicarb., 5 grains.
Magnesiæ calcin., 5 grains.
Bismuthi salicyl., 5 grains.

M. f. pulv. Three to five daily. (*Huchard.*)

As a pulmonary antiseptic and for relief of headache and muscular pains.

℞ Benzol. pur., 80 minims.
Spr. vini rectif., 1 oz.
Tinct. chlorof. comp., 3 drs.
Mucil. tragac. ad 8 oz.

M. f. mist. A tablespoonful every three hours in lemonade. (*Robertson.*)

Carbolic acid in influenza.

℞ Acid. carbolici pur., 2 mins.
Syrupi simp., 40 minims.
Tr. cardam. comp., 10 min.
Spr. chloroformi, 10 min.
Aquæ menthæ pip. ad 1 oz.

M. f. haust. To be given every four hours until the temperature is normal. Give also for sleeplessness at night,

Pulv. ipecac. comp., 10 grs.

Syrup for the cough.

℞ Liq. morph. hydrochlor., 1 dram.
Acid. hydrobrom. dil., 1 drm.
Chlorof. pur., 3 minims.
Tinct. limonis, 1 dram.
Syrupi ad 1½ oz.

M. f. syrup. A teaspoonful for the cough. (*Simson.*)

Mixture in influenzal pneumonia.

℞ Ammonii carb., 4 drams.
Tinct. cinchonæ, 1½ oz.
Spr. ammoniæ arom., 4 drs.
Decoc. cinchonæ ad 12 oz.

M. f. mist. Two tablespoonfuls with a tablespoonful of lemon juice in effervescence every four hours. (*Whitla.*)

Camphor in influenza.

℞ Spirit. camphoræ, 2 drams.
Tinct. lavandulæ, 2 drams.
Spirit. chloroformi, 1 dram.
Mucilag. tragacanthæ, 2 oz.
Aquæ ad 6 oz.

M. f. mist. Two tablespoonfuls every four hours. (*Devereux Long.*)

For the pulmonary complications of influenza.

℞ Ammonii chlor., 2 drams.
Apomorph. hydrochlor., 1 grain.
Mist. glycyrrhizæ co., 1½ oz.
Syrupi, 1½ oz.

M. f. mist. A dessertspoonful every two hours. (*H. C. Wood.*)

For the diarrhœa of influenza.

℞ Bismuthi subnit., 10 grains.
Acid. carbolici, 1½ grain.

In a capsule. One every two, three, or four hours. (*H. C. Wood.*)

Capsules for influenza.

℞ Salol, 60 grains.
Phenacetin, 40 grains.
Quininæ sulph., 20 grains.

M. et divide in cap. 20. Two to be taken every three hours. (*E. B. Palmer.*)

For severe neuralgic pains in influenza.

℞ Exalgine, 75 grains.
Tinct. aurantii 75 minims (rub together and add sufficient alcohol to dissolve the exalgine).
Syrupi aurantii, 1 oz.
Aquæ destill. ad 5 oz.

M. f. mist. A tablespoonful for a dose (one or two doses will usually suffice). (*Bardet.*)

To relieve headache, pain, and sleeplessness in influenza.

℞ Chloral, 22 grains.
Syrupi codeiæ,* 1 oz.
Infusi tilliæ,* 3 oz.

M. f. mist. A third to be taken at first, followed by a tablespoonful every hour.

(*Larmande.*)

In pneumonia and post-influenzal asthenia.

℞ Tinct. kolæ, 1 oz.
Tinct. cocæ, 1 oz.

M. f. mist. Two to four teaspoonfuls daily in water.

(*Huchard.*)

Subcutaneous injection of camphor in influenzal pneumonia.

Dissolve camphor one part in sterilised olive oil ten parts.

(*Huchard.*)

Diaphoretic in influenza.

℞ Pilocarpinæ hydroch., ½ gr.
Morphinæ sulphatis, ⅓ grain.
Aquæ, 3 oz.

M. f. mist. A teaspoonful every fifteen minutes.

(*H. C. Wood.*)

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* French codex.

CHAPTER V.

THE TREATMENT OF CHOLERA.

Cholera a Specific Microbic Infection — Mode of Diffusion — Course and Symptoms—(1) *Stage of Invasion*, Gradual or Sudden—Purging—Vomiting—Cramps—(2) *Stage of Collapse*, or "Algid" State—Symptoms of this Stage—(3) *Stage of Reaction*—Cholera Typhoid—Choleriue—The "Comma" Vibrio —Its Mode of Action—Anti-choleraic Vaccination—Prophylactic Measures—Indications for Remedial Treatment—Purgatives — Castor Oil—Calomel—Chloroform and Camphor—Turpentine—Caution in the Use of Opium—Intestinal Antiseptics — Salol — Chloroform—Tribromophenol — Bismuth — β-naphthol—Thymol—Hot Intestinal Injections of Solution of Tannin—Quinine—Intravenous or Subcutaneous Injection of Warm Saline Solutions — Subcutaneous Injections of Camphor and Oil—Hot Baths, etc., etc.—*Résumé.*

In order that we may establish **rational indications** for the **treatment** of cholera, we must first inquire briefly into its pathological nature and its characteristic symptoms and manifestations.

It has now been clearly established that cholera is a disease resulting from a *specific bacillary infection;* the pathogenic organism, the presence of which stands in causal relationship to this disease, being the *comma bacillus* or *vibrio* of Koch.

The infection is conveyed from infected to non-infected districts by human agency, and the spread of epidemic cholera always follows the accustomed routes of human intercourse and travel. Contaminated water plays the chief rôle, directly or indirectly, in its diffusion and spread, just as it does in the case of typhoid fever. At the same time it is necessary to remark that the infective organism may, both in the case of cholera and typhoid, be conveyed in a more direct manner from the infected to the non-infected. And it does not follow, because water is the agent chiefly concerned in its spread, that it cannot be conveyed in other ways. The fact to be remembered is, that the cholera infection depends on the passage of a specific micro-organism from the interior of one human body into that of another.

What are the characteristic course and symptoms of this extremely fatal malady? So far as can be ascertained, the *incubation* period of Asiatic cholera is a brief one. The average is probably about two or three days; in some instances it has appeared to be considerably longer, and in many much shorter—not more than twelve hours. It is usual to recognise three stages in the course of the disease—(1) that of invasion, (2) that of collapse, and (3) that of reaction.

The period of *invasion* may be *gradual* or sudden, and this probably depends on the amount, or the virulency of the infective agent received into the body in each case, or on the individual sensitiveness and reaction to the pathogenic organism. It should not be overlooked, because it has an important bearing on the success of treatment, that different individuals, and the different composition and state of the contents of their alimentary canal, act as so many different culture media to the pathogenic microbe; and the factors being different in different cases, the results are different. We desire to emphasise this, because the failure of therapeutic resources is constantly spoken of as though they ought to have an *absolute* rather than a *relative* influence on the cure of disease. Nothing could be more irrational. The idea is a survival of the old belief that the *cure of disease* is something supernatural, instead of being as strictly conditioned as every other event in life.

Upon the nature of the *invasion* stage will depend much of the success or non-success of therapeutic intervention. It is sometimes *gradual*, and may last for two or three days, and is then marked by moderate diarrhœa, with colicky pains, a sense of exhaustion and general depression, noises in the head, and a pale and anxious countenance. It is during this period that we may hope to be able to counteract, in an effectual way, the toxic influence of the infective agent.

In other instances the invasion is sudden. The patient is struck down suddenly with alarming depression, and generally with violent purging. The contents of the bowels pour out in a copious liquid stream, and rapidly drain the blood of its fluid constituents. The evacuations, at first bile-stained or fæcal, soon become colourless, and have been spoken of as "*rice-water stools,*" from their resemblance to water in which rice has been boiled. They contain enormous numbers of comma bacilli and other bacteria. At the same time, *profuse vomiting* of the same kind of fluid usually occurs. Violent and very painful *cramps* may now appear, affecting chiefly the lower extremities and the abdomen; and the patient may pass into the second stage—the "*algid*" state, or state of *collapse.* This may come on within a few hours of the commencement of the purging, and its symptoms have been regarded as dependent, either on the amount of toxic material absorbed from the intestine, or on the enormous drain of fluid from the body, so that there is failure of the circulation, as the thickened blood cannot flow freely, and the pulse becomes feeble, thread-like, or wholly imperceptible. The surface is livid, cold, shrunken, and covered with a clammy sweat; the countenance also is shrunken and blue, the eyes are sunk, the nose pinched and pointed, the tongue cold, the breath cold. The axillary temperature is sub-normal—93° to 94°—but the temperature in the rectum and vagina may be found raised, in this stage, from 100° up to 104°. It was noted at Hamburg that severe cases have a very low temperature from the first, and that the fatal ones terminated without its rising. The respirations are quickened up to 30 or 40. One of the most distressing symptoms due to loss of fluid from the body is *intense thirst.* There is great muscular feebleness and exhaustion, sometimes accompanied by distressing restlessness, at others by complete mental apathy. There is, however, no loss of consciousness, and the patient may be roused to reply to questions, although the voice is feeble or almost inaudible. The abdomen is retracted, distressing hiccough frequently occurs, and there is often complaint of burning heat in the epigastrium. Another consequence of the drain of water from the blood is *suppression of urine.*[*]

Death may occur rapidly in this collapsed stage—in twelve hours or less—or it may be protracted to the second day; or the patient may pass out of this stage of collapse into the third *stage*, that *of reaction.* After, perhaps, a brief sleep, the circulation improves, the surface becomes warmer, the features are less shrunken, and there is some return of colour; the temperature in the axilla rises a degree or two. Recovery is often extremely and remarkably rapid. In some cases, however, relapses occur during the reactive stage, purging and vomiting return, and death from exhaustion may follow. Sometimes there is only partial reaction, and the pulse remains weak, the surface cold, the bowels relaxed, and there are signs of nervous irritability and exhaustion—drowsiness and depression, or sleeplessness, and even maniacal excitement. The appearance of a roseolous exanthem on the skin is observed in some cases during convalescence. The renal secretion is slowly re-established, and usually contains albumen. It is important to see that it is not retained in the bladder.

There is sometimes observed a form named "*cholera sicca,*" in which there is no purging, and this is usually a rapidly fatal form, and the intestines are found, *post mortem,* filled with the rice-water evacuations. It is probable that in these cases the toxic action on the nervous system is especially virulent, and the intestinal walls are paralysed.

A typhoid state—*cholera typhoid*—sometimes occurs during the reaction period, marked by delirium, a dry tongue, feeble rapid pulse, and slight rise of temperature. This may terminate rapidly in coma, or after some days it may end in recovery. It has been referred to uræmia.

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[*] Sir Geo. Johnson refers the symptoms of collapse, and the suppression of the biliary and renal secretions, to spasm of the pulmonary vessels induced by the presence of the cholera toxine in the blood. During the recent epidemic at Hamburg the collapse in many cases occurred before the blood had become thickened by loss of water.

The form termed *cholerine*, which is often observed during epidemics of cholera, and which assumes various degrees of severity and is attended with diarrhœa, colic, vomiting, cramps, and occasionally slight collapse, is probably in some cases a kind of abortive cholera, and in others merely an intestinal catarrh contributed to by nervous alarm and errors in diet.

The **"comma vibrio"** is always found in the discharges from the bowels and in the contents of the intestine in this disease; it has the form of a slightly curved rod, thicker than the tubercle bacillus, and about one-half its length. Although several micro-organisms have been found resembling it in shape, its true specific characters are distinctively displayed in cultures in various media. It has not been observed to form spores, and it does not appear to be a very resistant organism. It perishes, more or less quickly, in common water. It has been found only in the intestinal canal, and the symptoms it gives rise to are wholly due to the toxines * it forms there, as it does not enter the blood or tissues; indeed, it is killed off rapidly if introduced into them.

The pathogenic microbe of cholera belongs, therefore, like that of diphtheria, to the class of infective microbes which produce an "intoxication" by the absorption of the products of their vital activities from the locality, outside the tissues, in which they have settled—that locality, in this case, being the intestinal canal.

If the system could be rendered insensible to this poison, which is elaborated through the agency of the cholera bacillus in the intestine, immunity from this disease would be secured; and this is the object of Haffkine's, and other methods, of anti-choleraic vaccination. The system is first acclimatised to a *weak* cholera poison (first vaccine), and afterwards to a *strong* cholera poison (second vaccine). The second must consist of the strongest cholera poisons obtainable, in order that the protection may be adequate. The object is "to enable the system to tolerate such quantities of cholera poisons as might be expected to be absorbed from the intestine during the interval which elapses between the invasion of the alimentary canal by the comma bacillus and the natural elimination of that bacillus, which invariably takes place when convalescence becomes established after an attack of cholera." It does not aim at producing a tolerance of enormous amounts of cholera poison, as that would be impossible, but to induce a sufficient tolerance of the cholera poison to "enable the system to put forth its whole reactive power." "The utility of the method will evidently entirely depend upon whether the tolerance of the cholera poison, which can be induced in man by means of M. Haffkine's method, is adequate to tide over the critical hours which supervene upon the outbreak of choleraic symptoms. This is a question upon which only *actual clinical experience* can decide."* Klein has contributed a very important criticism of this method which we have only space to mention, and Klemperer has suggested other, and perhaps more effectual, means of producing immunity, which will be found described in one of our references.† The subject is, it appears to us, not yet ripe for decisive judgment. The **clinical** test is the only real one, and when this is adequately applied, the whole theory, built up from experiments on animals, may possibly collapse; for the production of the phenomena of cholera may involve the co-operation of factors which it has not been possible to reproduce in these experiments. In the human intestinal canal the cholera microbe must be surrounded by conditions quite different from those which obtain within the peritoneal cavity of the guinea-pig, to which Haffkine's experiments have been chiefly confined, and the most destructive experimental criticism of Haffkine's method is that made by Klein in showing that an animal rendered "immune" against Haffkine's strong vaccine yet succumbs to liquefied *gelatine cultures* of the comma vibrio injected into the peritoneum! Besides, it is well known from such experiments as Pettenkofer and others have made, that the introduction of the cholera vibrio into the alimentary canal does not necessarily produce cholera, and it is a wholly unjustifiable assumption, to suppose that we know what are the co-operating conditions, which determine the development of the toxic action of this pathogenic microbe in the human intestine. It has been stated, on the authority of Cornet, that the cholera bacillus may be found in the stools of patients completely convalescent from the disease, just as the microbe of diphtheria may be found in the mouths of children who are convalescent; and, as we have pointed out when treating of diphtheria, a pseudo-bacillus has been found in the mouths of many children who have apparently never been exposed to any diphtheritic infection. Cholera, therefore, may be conveyed by persons who are no longer ill of that disease; but the organism may not then be very virulent, and this may account for the mildness of the early cases in an outbreak, for we are at present ignorant of the conditions which determine virulency. Professor Nencki's experiments led him to the belief that it is not infection with the comma bacillus only that causes the virulent form of cholera, but that contact with other bacteria in some way increases its virulence.* Professor Hueppe,† as the result of his study of the outbreak of cholera at Hamburg, concludes that there must be three links (or factors) in the chain of infection—the exciting cause of the disease, which he terms x (the "comma" bacillus), the individual predisposition z, and the local and temporary conditions y. Bacteriologists, he considers, under the guidance of Pasteur and Koch, have exaggerated the x. The absence of either of these links, however brought about, must prove protective; so that general prophylactic measures have the greatest possible chance of success.

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* Hueppe says the poison is a peptone split up from the genuine albumens of the body in the absence of air. This poison may be obtained from the urine when it is again secreted.

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* See Profs. Wright and Bruce, *British Medical Journal*, Feb. 4; Haffkine's Lecture, *British Medical Journal*, Feb. 11; and Klein's Criticism, *British Medical Journal*, March 25 (p. 716) and April 1st, 1893.

† Klebs, of Zurich, claims to have cured in three days several cases that were regarded as hopeless. He injected the metabolic product of a pure culture of the comma bacillus, and the temperature rose in the algid state, and the later reactionary fever was absent; but the good results were too few to found any safe conclusion upon them.

From the consideration of the fact that, in this last epidemic at Hamburg, the most serious attacks came on quite suddenly, and that the stage of collapse from intensity of intoxication, "acute chemical poisoning," was reached with exceeding great rapidity, it would seem that an anti-choleraic vaccination would be out of the question, precisely in those cases which are least amenable to ordinary treatment. For in the cases in which the onset is gradual, the results of treatment are, on the whole, satisfactory. Cantani's observations of the last epidemic in Naples induced him to regard protective inoculation with mistrust, for he there encountered well-marked second attacks of cholera four to six weeks after the first equally well-marked attack.

Plain and simple as **prophylactic** measures against attacks of this disease are, they are undoubtedly difficult of application to the members of those classes who invariably become its first victims, and who are especially responsible for its spread. The one word "*cleanliness*" comprises nearly all that can be urged by way of prevention; but it is not of much use preaching cleanliness to those classes who have all through their lives been utter strangers to its meaning.

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* *British Medical Journal*, Feb. 11, 1893, p. 317.

† It will never be possible, he maintains, to prevent by bacteriology an epidemic which comes suddenly from a great distance by leaps and bounds. (*British Medical Journal*, March 11, 1893.)

"Cleanliness" means additional trouble, additional labour, and filthy habits are bred of indolence rather than of ignorance. It is only panic, and the fear of death, that will rouse these classes, for a time, to the energy that is needed in order to be clean!

During a visitation of cholera, actual or threatened, it is needful to pay more than usual attention to the observance of the ordinary laws of health. All causes of physical exhaustion, excesses of all kinds, should be avoided. Moderation in food, in exercise, in physical and mental effort, should be observed. Everything that can lower the general tone should be guarded against. Great moderation in the use of alcoholic stimulants should be especially enjoined. All drinking water and all milk must be boiled and kept in carefully closed vessels. The water used for washing the person and all domestic utensils must also be boiled, unless its source is absolutely beyond the possibility of contamination.

All outhouses and receptacles for refuse should be cleansed and freely white-washed, and the refuse destroyed. No overcrowding of work-, sleeping-, or other rooms should be permitted, and adequate ventilation should be enforced. No accumulations of dust should be allowed, and all walls, floors, shelves, etc., should be frequently cleansed of such deposits. It is best to use for this purpose wet cloths wrung out in an antiseptic fluid and plunged after use into boiling water containing some antiseptic. Cleanliness of the persons of domestics and others should be seen to, and particularly those who have the care of children, amongst whom often the disease first appears. *Children* require the most careful watching, as they are so apt, those of the poorer classes, to consume unclean food and to be dirty in their personal habits. Fruit and vegetables should be eaten with great caution, and only such as are in a perfectly fresh and sound state. All food bordering on decomposition is most dangerous. The agency of **flies** in spreading cholera has been abundantly demonstrated, and great care should therefore be taken that they do not settle on or contaminate any food supplies, and efforts should be made to exclude them from dwelling-houses. Isolation of infected persons should be strictly carried out, and everything that is used in, or comes from, the sick-room should be thoroughly disinfected, as has already been pointed out in the preceding chapters on the treatment of infective fevers.* Attacks of diarrhœa or stomach disturbance should receive immediate medical attention, and great caution should be observed in treating such cases. It should be borne in mind that if the attack happens to be a mild or abortive form of cholera, opium is likely to do harm, and it is in all cases safer and better to give a mild purgative such as Gregory's powder, with some warm carminative such as the aromatic spirits of ammonia and essence of peppermint. If after such a dose an astringent seems necessary, it is best to give an intestinal antiseptic, such as bismuth carbonate, or salicylate.

From a consideration of the nature and pathological characters of this disease the following **indications** for remedial **treatment** may be deduced :—

(1) To destroy or annul the activities of the cholera bacilli in the intestines, and to render the chemical poison they elaborate there inert, and to sweep both out of the body. (2) Subsequently to protect the denuded intestine. (3) To eliminate or neutralise the already absorbed poison. (4) To replace the lost fluid so as to counteract the thickening of the blood due to this loss. (5) To relieve symptoms,

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* The following have been found in Germany to be the best and cheapest disinfectants for use on a large scale :—(1) Chlorinated lime. (2) *Milk of lime*, made by breaking up 1 part of quicklime in 4 parts of water ; the lime is first slaked with a portion of the water, and the rest stirred in ; this is kept in a closed vessel, and shaken when used. (3) Carbolic acid. (4) Steam sterilisation and the boiling temperature. (5) For washing purposes, soft (potash) soap, 1 lb. to 17 quarts of water, and 5 per cent. of carbolic acid added ; articles are completely immersed in it and boiled for half an hour. The *stools* have been disinfected in the wards with *lysol* or carbolic acid, and afterwards thoroughly mixed with chloride of lime. Lysol is a coal-tar product resembling carbolic acid, but is cheaper ; it is used in 1 to 3 per cent. solutions.

chiefly the *vomiting* and the painful cramps. We must remember that the functions of the liver and kidneys are for the time suspended. This is believed by some to be dependent on the loss of the fluid essential to their function, while Sir George Johnson considers it to depend on spasm of the pulmonary vessels.

It will be seen from these indications that the *rational* and scientific treatment of cholera is now admitted nearly on all sides to be, as Sir George Johnson insisted many years ago, mainly **eliminative** and **antiseptic.** "Purgation and antisepsis are to some extent interchangeable terms." When cases of cholera are seen in the first stage, when nature is making an effort to throw off the poison by the bowels, we must aid the natural effort by the administration of an unirritating purgative, and if we can at the same time combine with it an intestinal antiseptic, we shall be fulfilling very completely the first indication. Castor oil is one of the best purgatives for this purpose. Calomel is also valuable, and it is an antiseptic as well as a purgative. Gregory's powder, together with a few grains of calomel, is suggested by Sir George Johnson if, owing to vomiting, castor oil cannot be taken.

We would suggest the following emulsion of castor oil :—

℞ Olei ricini	6 drachms.
Chloroformi	20 minims.
Ess. menthæ pip.	40 ,,
Syrupi et mucilaginis ... ad	2 oz.

M. f. mist. A tablespoonful every 15 minutes until the whole is taken.

If either of the doses is vomited it should be immediately repeated. If for any reason castor oil cannot be taken we should give calomel—a dose of 5 grains at first, and a grain every hour until about 10 grains have been taken; then we should continue to give it in $\frac{1}{4}$-grain doses every two hours as an antiseptic. We should give at the same time a stimulating and antiseptic mixture of chloroform and camphor; and as gastric absorption is almost abolished, we might expect this mixture to reach and disinfect the small intestines.

The following is a suitable formula :—

℞ Chloroformi		80 minims.
Spirit. camphoræ		2 drams.
Spirit. ammoniæ aromat.		2 ,,
Mucilaginis acaciæ		2 oz.
Aquæ menthæ pip.	ad	8 ,,

M. f. mist. Two tablespoonfuls every hour.

The chloroform and camphor both yield antiseptic and anæsthetic vapours, and we might hope these would have an anti-toxic and soothing effect in the small intestine; or capsules of chloroform and camphor might be given. Sir George Johnson suggests that turpentine, and not castor oil, should be given if there should be hæmorrhage from the bowels —20 minims in mucilage every two hours, and iced water to drink. Turpentine would doubtless prove a valuable intestinal antiseptic.

Treatment on these lines, in the early stage, has been found to be the most successful in the recent epidemics in Germany, Russia, and Italy. One Russian physician began the treatment with 20 grains of calomel and an ounce of castor oil, and he reports that the mild cases recovered quickly, and so did many in the algid state. Another started with a purgative dose of calomel combined with naphthalin, and continued with smaller doses of each. In Hamburg, mild threatening cases, were stopped by an initial dose of castor oil, and in more advanced stages calomel in $1\frac{1}{2}$-grain doses or in repeated small doses of $\frac{1}{6}$ to $\frac{1}{8}$ grain was found to answer well. In severe attacks, those of well-marked general intoxication, we are informed "calomel was the only drug that held its own."

In the reports of recent epidemics there is a general condemnation of the use of *opium* to arrest the diarrhœa of the early stage. Cases so treated did worse than under any other treatment. The early use of opium increases the risk of the absorption of the cholera poison and favours its retention in the body. In Hamburg opium by the mouth, in sedative doses, had a decidedly unfavourable effect, but small doses of an aqueous solution, given subcutaneously, sometimes acted remarkably well. We recognise the usefulness of opium when given at the right time, in the more advanced stage, to relieve *pain* and to lessen nervous exhaustion. It is doubtless by its soothing and conservative action on the nervous system, rendering it less sensitive to the morbid toxines that have been absorbed, that opium is valuable. It, in this way, lessens the tendency to fatal exhaustion; but small doses only should be given.

Other methods have been adopted for neutralising the effects of the bacillus, and its chemical secretions, in the intestine, and with good results. The part to be played by purgatives is obviously a brief one, and, after the toxic contents of the intestine have been swept away, we have to trust to intestinal antisepsis to neutralise any further development of toxines; and we have to fulfil another indication, and that is "to protect the denuded intestine." If we continue the use of calomel, it should be for its antiseptic action, and repeated small doses of $\frac{1}{6}$ and $\frac{1}{8}$ grain have been found best for this purpose.

Salol, as an intestinal antiseptic, has not maintained the reputation that was somewhat prematurely claimed for it. Those who had the best opportunities of testing its value in the recent epidemic concluded that no confidence could be placed in it; and we note that one observer, who wrote in its praise, gave 15 minims of chloroform with 10 grains of salol every two hours, and he does not appear to have realised that the chloroform may have been the more efficacious remedy of the two. We have a great belief in the value of chloroform, if it can be made to reach the intestinal canal; and Desprez has warmly advocated the use of the following mixture:—

℞ Chloroformi		15	minims.
Alcohol		2	drams.
Ammonii acetatis		2½	drams.
Syrup. morph. hydroch. (Fr. Codex)		10	drams.
Aquæ	ad	5	oz.

M. f. mist. A tablespoonful every half hour until the symptoms are relieved.

He also recommends chloroform water as a preventive. In a former epidemic in England we observed apparently preventive properties in chloroform and camphor drops, made by dissolving 3 ounces of camphor with 1 dram of chloroform; 4 or 5 drops on a small lump of sugar were taken two or three times a day.

Tribromophenol (or *bromol*), obtained by the action of bromine on phenol, has been highly praised by Prof. Hueppe as a remedy in cholera. It is not poisonous, and has "almost a specific effect" on comma bacilli. He uses a combination with bismuth—tribromophenol bismuth; this neutralises the poison and protects the intestinal mucous membrane. He gives 75 to 105 grains a day in 7½- to 15-grain doses. He has used it in all stages and forms of severity, and he has been very satisfied with the results. Next to this he considers calomel the best remedy.

A combination of *β-naphthol* and *bismuth* has been given by Nencki to promote intestinal antisepsis, and with good results.

Thymol has also been found very fatal to the cholera microbe; a 1 in 1,000 solution in water is said to kill the comma bacillus in five minutes; and it has been proposed to inject into the bowel 4 grammes (60 grains) of thymol dissolved in 4,000 grammes (125 oz.) of water. This brings us to the recommendation of Cantani, which has been largely adopted in the recent epidemic and widely approved—viz. large **intestinal injections of solutions of tannin:** 3 to 4 pints of a 2 per cent. solution of tannin, with or without a few drops (20 to 40) of laudanum, at a temperature of 100° to 104° F.

Cantani believes that with these large injections, given slowly, with the buttocks raised, the resistance of the ileo-cæcal valve is overcome, and that the fluid finds its way into the small intestine. The author of this method asserts that, if applied in the early stage, nearly every case recovers; and most of those who had charge of cholera cases in Hamburg write in its praise. Hueppe says it "cleans the large gut, moderates the diarrhœa, and warms up the chilled body"; and others testify to its "curative effects" in moderately severe cases. The injections are given after each stool, usually about every three or four hours; they are said by Cantani to increase the acidity of the intestinal contents, to kill the cholera bacilli, and to lessen their toxic effects. Some Russian physicians also wash the stomach out with Cantani's solution of tannin (5 in 1,000) at 104° F. A quart of the solution is slowly injected into the stomach through a hard indiarubber tube, and two quarts are also injected by the rectum. Vomiting is arrested thereby and diarrhœa checked. Alexinsky, who adopted this method, gave also 20 drops every hour of equal parts of Hoffman's anodyne and ethereal tincture of valerian; also calomel $\frac{1}{10}$ grain, opium $\frac{1}{10}$ grain, and bismuth 5 grains, every hour. Attention has been called to the value of *quinine* in cholera by some Russian physicians, and the anti-toxic effect of this drug has perhaps scarcely been sufficiently examined in this disease. The hydrochlorate has been given subcutaneously in 30 per cent. solutions in boiling distilled water, with the addition of a little chloride of sodium; and after cessation of the vomiting, it has been given by the stomach in combination with salicylate of bismuth and opium. Brilliant results from its use are claimed. Professor Botkin used to give quinine both as a preventive and a remedial agent.

The *third* indication, "to eliminate or neutralise the already absorbed poisons," is one that, with our present knowledge and resources, it is not easy to fulfil. We may, perhaps, best fulfil it by endeavouring to aid the system to eliminate the poison in its own way, by helping it to tide over the serious part of the crisis—*i.e.* the first intense shock and injury of the absorbed poison—and, in order to do this, we must give effect to the *fourth* indication, which is "to replace the lost fluid, and so to counteract the thickening of the blood due to its loss" and revive the circulation. Now this can be and has been done, especially during the recent epidemic in Hamburg, in a very effectual manner; and by universal testimony many lives have been saved thereby, although the method employed frequently fails to save the more desperate cases.

The method used for this purpose is the *intra-venous* or *subcutaneous injection* of large quantities of warm saline solution. These injections cannot repair the injury done by the poison to the heart muscle, or to the vaso-motor nerves, but they dilute the poison and carry off the products of metabolism; they stimulate the heart's action, and the constitution gains time to struggle with the poison, and often with success; they also afford an opportunity of strengthening the patient with food and medicine. The solutions used are usually composed of 6·6 per cent. of common salt, dissolved in water, sterilised by boiling, and rendered alkaline by the addition of a little sodium bicarbonate. Sometimes thymol or hydrogen-peroxide is added from 0·1 to 1·0 in 1,000.

If injected into a vein, about 3 to 4 pints are used *warm*—rather less if injected subcutaneously. In either case the transfusion is made by gravitation only.

"The warm solution is placed in a glass jug with a nozzle, to which a wide insoluble tube is attached, and either hung up on a hook in the wall or placed on a special stand, a fall of about 4 to 5 feet being allowed, which has always been found sufficient (Fig. 7). A vein is laid bare by an incision 2 to 3 inches long (usually in the arm—when both arms have been used the saphena is next tried) with antiseptic precautions and tied. The cannula is introduced and tied in above the ligature, the pinch-cock is opened, and the whole quart is infused in two to four minutes. The effect is sometimes astounding. The cyanotic, algid, pulseless, breathless creature, with shrunken, wrinkled features, sunken, lack-lustre eyes, and the whole aspect of a moribund, will, as if from a deep sleep, arouse himself and tell the delighted doctor he feels vastly better."

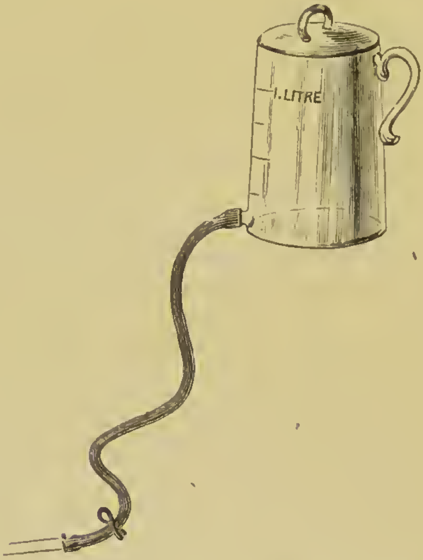

Fig. 7.—Vessel used for Intravenous Injections.

If the injections are made subcutaneously, as Cantani advises, it is desirable, owing to the large quantity that has to be injected, to introduce it at two or three places. The hypochondriac regions are usually selected.

Subcutaneous injections of camphor dissolved in olive oil (20 minims) every half-hour or hour have been often combined with the above method, with great advantage in the algid state.

Other measures of minor importance have been found useful in dealing with certain symptoms. To restore warmth and circulation prolonged hot baths (half an hour) at a temperature of about 100° F. have been used, and after the bath a very large hot mustard poultice has been applied over the whole of the abdomen and lower half of the chest. This measure has been found very useful in many cases, but in the *algid* state it will be better to have recourse to the large hot rectal injections and the subcutaneous injection of hot saline solutions. Some, however, consider hot baths more exhausting than beneficial, and prefer hot fomentations, hot sand-bags to the feet and legs, and friction with the warm hand. The *painful cramps* are relieved by those hot applications, and also by subcutaneous injections of small quantities of morphia or by codeia internally. The *vomiting* may be relieved by sucking ice or by a few doses of cocaine with chloroform; or, as we have mentioned, by washing out the stomach.

To relieve the *thirst*, hot tea and coffee, toast and water, and in the collapse stage hot water, should be given freely, avoiding, however, over-distension of the stomach.

A small amount of brandy or whisky may be added to the hot tea or coffee, and champagne and light wine may be given, but large quantities of strong alcoholic stimulants are not well borne.

During the febrile reactionary stage Sir George Johnson advises a spare liquid diet, copious diluent drinks, saline aperients, and ceunter-irritation over the lungs and kidneys; and during the convalescent period a tonic of quinine and hydrochloric acid, and for some time only light, chiefly fluid, food.

The treatment that has been found to answer best in the recent epidemics of cholera may be thus resumed:—In the early stage gentle purgatives to aid the natural efforts at elimination of the infective microbe and the toxic substances it elaborates;—intestinal antiseptics, of which calomel is the best, to neutralise the toxic action of the comma bacillus in the intestine, and bismuth to protect the denuded intestinal membrane;—avoidance of the use of opium for the purpose of checking diarrhœa, its use being reserved for the relief of pain and for its soothing effect on the nervous system;—hot large intestinal injections of tannin;—in the algid state, the intravenous or subcutaneous injections of large quantities of hot saline solutions;—subcutaneous injection of camphor to stimulate the circulation, and hot baths and other hot applications to maintain the heat of the body;—and the various remedies mentioned to relieve special symptoms.

THE END.

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* Compiled by Mr. Henry Johnson.

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